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KENTUCKY
REPORT TO CONGRESS
ON
WATER QUALITY

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND
ENVIRONMENTAL PROTECTION CABINET

DIVISION OF WATER

JUNE 1994

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ACKNOWLEDGEMENTS

The staff of the Water Quality Branch within the Division of Water are primarily responsible for the preparation of this report. Their dedication, persistence and willingness to put in many extra hours of work are to be commended. Also, appreciation is extended to personnel in the KPDES Branch, Groundwater Branch, Facilities Construction Branch, and Field Operations Branch for their contributions to the report. Assistance from the Division of Environmental Services, the Ohio River Valley Water Sanitation Commission, the U.S. Geological Survey, the Division of Conservation, the Department of Fish and Wildlife Resources, the U.S. Army Corps of Engineers, the Department of Parks, Dr. David White at Murray State University, Jerry Terhune and his associates affiliated with the Louisville and Jefferson County Metropolitan Sewer District, personnel at the Big Sandy Area Development District, drinking water plant operators on several lakes, and Jeno Balassa of the Natural Resources and Environmental Protection Cabinet's GIS Section also is greatly appreciated.

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

This report was prepared by the Kentucky Division of Water (DOW) to fulfill requirements of Section 305(b) of the Federal Water Pollution Control Act of 1972 (P.L. 92-500) as subsequently amended and commonly known as the Clean Water Act. Section 305(b) requires that states submit to the U.S. Environmental Protection Agency (EPA) on a biennial basis a report assessing current water quality conditions. This report presents an assessment of Kentucky's water quality for the period October 1991 through September 1993. Topics that are discussed in the report are: 1) monitoring programs and data sources; 2) water quality conditions and use support of streams, rivers and lakes; 3) wetland issues; 4) groundwater issues; 5) water pollution control programs; and 6) recommendations on additional actions necessary to achieve the objectives and goals of the Clean Water Act.

Water Quality Assessment

The water quality assessment of rivers and streams in this report is based on the support of designated uses in state waters depicted on U.S. Geological Survey (USGS) 1:100,000 scale topographic maps, excluding the Mississippi River. The maps contain about 49,100 miles of streams, of which approximately 15,228 miles were assessed by the DOW and 664 miles of the Ohio River were assessed by the Ohio River Valley Water Sanitation Commission (ORSANCO). Total miles are less than the 55,300 miles reported in the 1992 305(b) report because of an updated data file (Reach File 3) provided by EPA on the 1:100,000 scale USGS maps.

Forty-four primary ambient monitoring stations, characterizing approximately 1,432 stream miles within the state, were in operation during the reporting period. Biological monitoring occurred at 24 of these stations during 1992 and 1993. In addition, seven lakes were sampled for eutrophication trends and two lakes for suspended solids impacts on secondary contact recreation. Five intensive surveys were conducted on 70 miles of streams for the evaluation of point source and nonpoint agricultural pollution, to determine baseline water quality, and to evaluate the status of water quality in streams assessed previously. Water Watch, a citizen's education program, expanded its membership and increased the number of waters "adopted" by local groups. Since its beginning, 345 groups have been established and 300 streams, 35 lakes, 30 wetlands, and nine karst or underground systems have been adopted. A water quality monitoring project produced data on stream water quality at more than 200 sites in seven of the 13 river basins in the state. Numerous watershed organizations, particularly in urban areas, have emerged in Kentucky and are dedicated to improving river and riparian management. The DOW has become increasingly involved with these organizations by providing them with technical support and information. Also, the DOW has created an international "Sister Rivers" project to link river groups from different countries with Kentucky-based watershed organizations.

Aquatic life and swimming uses were most commonly assessed. Including the Ohio River, full support of uses occurred in 11,416 miles (72%), uses were not supported in 2,883 miles (18%), and partial use impairment was found in 1,593 miles (10%) of the assessed waters. Swimming use was impaired to a greater extent than aquatic life use (Figure I). The major causes of use nonsupport were fecal coliform bacteria contamination (pathogen indicators), which affected swimming use, and siltation and organic enrichment, which impaired aquatic life use (Figure II). Nonpoint sources impacted about three times as many miles as point sources. The major sources of the fecal coliform contamination were sanitary (both municipal and package) wastewater treatment plant discharges, agricultural nonpoint sources, septic tanks, and straight pipe discharges. Sanitary wastewater facilities were also the source of the organic enrichment, while surface mining and agricultural nonpoint sources were the major sources of siltation (Figure III).

There have been some notable improvements in water quality. Chloride has decreased significantly at 19 ambient monitoring stations over the past several years. Trend analysis revealed that chloride levels in the Kentucky River have returned to near background levels. The decrease in chlorides is attributed to enforcement of KPDES permit limits on oil and gas production facilities, decreased oil and gas production, and differing stream flows. Nutrients have also exhibited decreasing trends at many stations across the state.

Seventy-six miles of a swimming advisory on the North Fork Kentucky River from Chavies to Beattyville were lifted in June 1993, although 86 miles of the advisory remain in effect. Bacteriological surveys at Lake Cumberland and Laurel River Lake indicated that the swimming use was supported in the main lakes and around major marinas and houseboat docking areas. No beaches were closed by the Parks Department during this reporting period. Fecal coliform contamination caused swimming advisories to be re-issued for the Licking River and two tributary streams near Covington.

Priority pollutants are the cause of degradation in some of the state's waters. Fish consumption advisories remain in effect for the Mud River and Town Branch in Logan, Butler, and Muhlenberg counties, the West Fork of Drakes Creek in Simpson and Warren counties, and Little Bayou Creek in McCracken County because of contamination from PCBs. The Ohio River remains posted with advisories because of PCB and chlordane contamination. The Ohio River advisories are specifically for the consumption of channel catfish, carp, white bass, paddlefish, and paddlefish eggs. New advisories were posted for carp and channel catfish in Green River Lake because of PCB spills from a gas pipeline compressor station, and for largemouth bass in five ponds on the West Kentucky Wildlife Management Area (McCracken County) because of mercury from unknown sources.

Figure I

SUMMARY OF INDIVIDUAL USE SUPPORT
RIVERS AND STREAMS

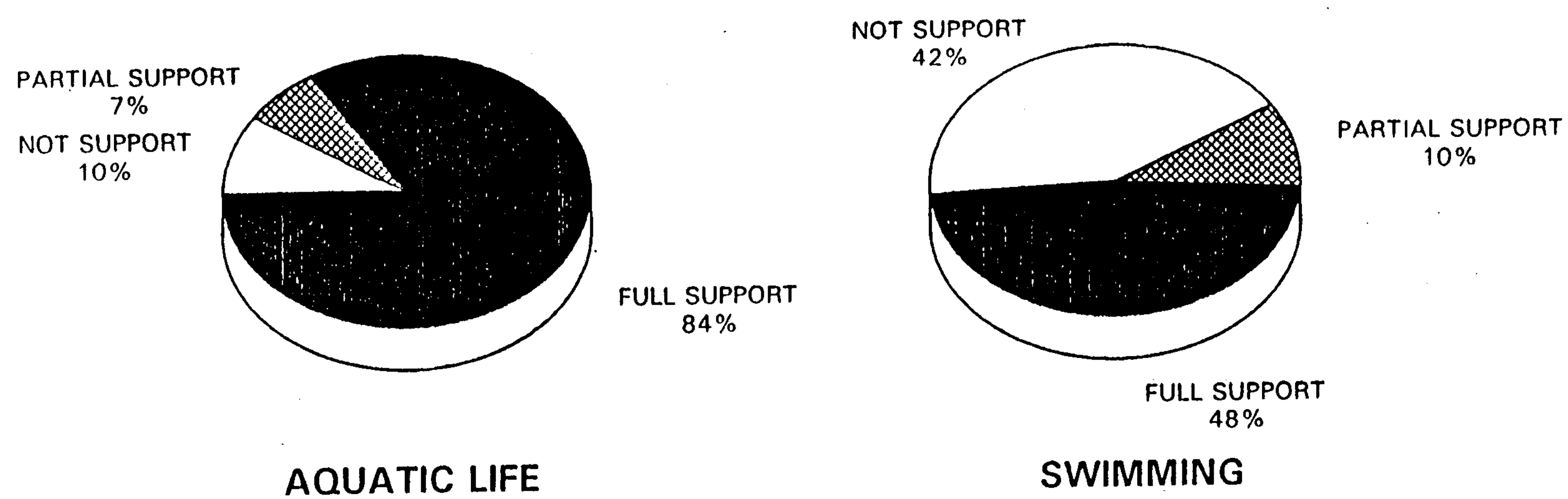


Figure II

CAUSES OF USE NONSUPPORT RIVERS AND STREAMS

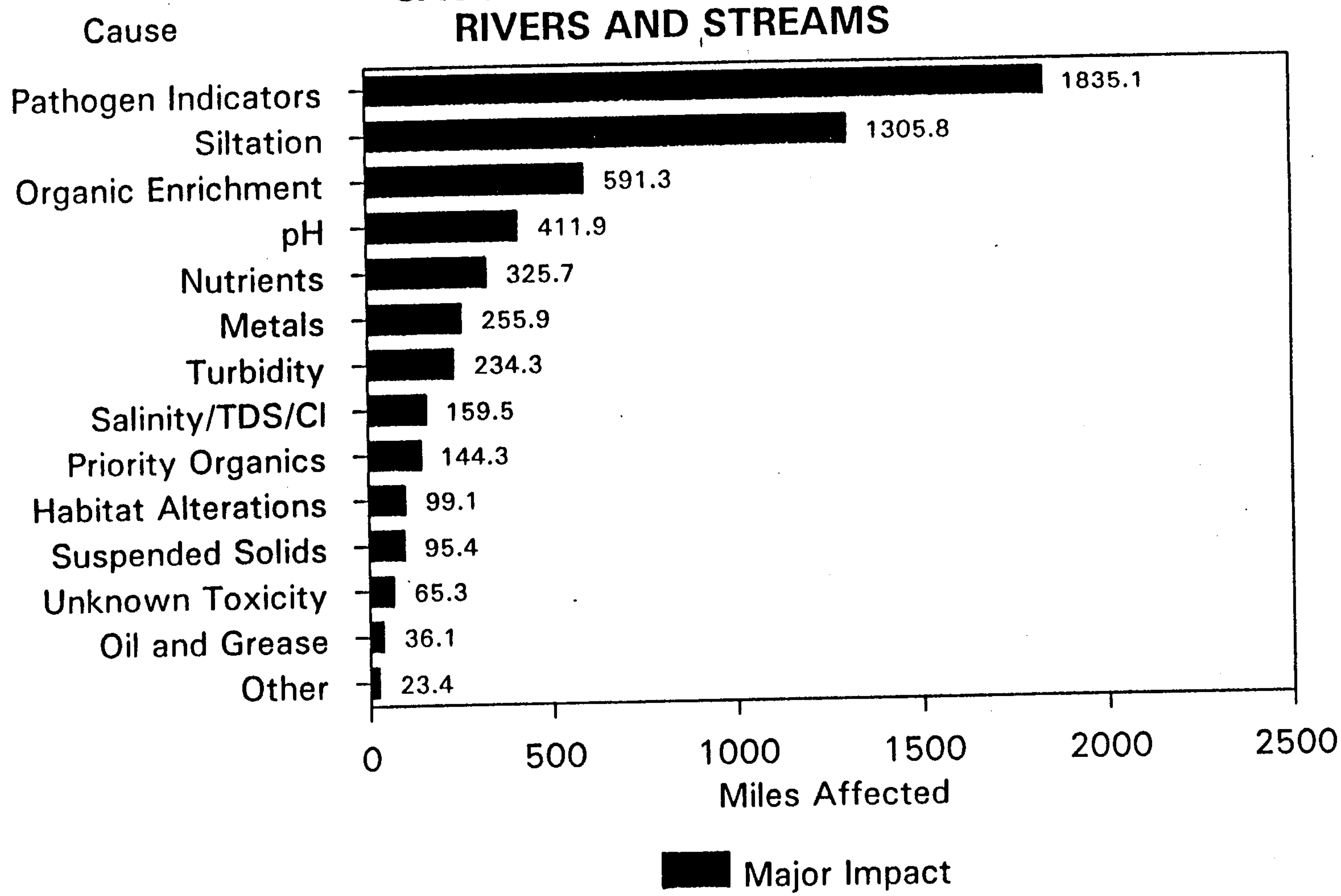
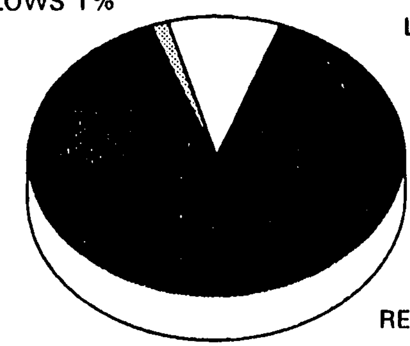
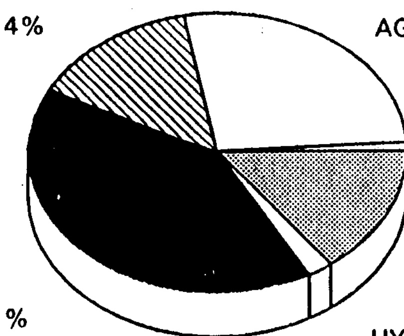


Figure III

SOURCES OF USE NONSUPPORT RIVERS AND STREAMS



Point Sources



Nonpoint Sources

Twenty-one fish kills totalling about 101,000 fish were reported during 1992-1993, affecting 38.8 miles of streams. The number of fish kills, waterbodies affected, miles affected, and fish killed were less than in previous reporting periods, continuing a declining trend since 1986. Fish kills were most commonly attributed to chemical spills.

Wetlands are considered waters of the Commonwealth and are protected from loss and degradation primarily through Water Quality Certifications issued by the DOW under the authority of Section 401 of the Clean Water Act. In 1992-93, certifications were issued for 255 activities, denied for 38 activities, and either waived or exempted for another 42 activities. Unavoidable impacts to wetlands require mitigation to compensate for lost wetland acreage and function.

The water quality assessment of lakes included more than 90 percent of the publicly owned lake acreage in Kentucky. Sixty-seven of 103 lakes (65 percent) fully supported their uses, 31 (30 percent) partially supported uses, and five (5 percent) did not support one or more uses. Ten lakes had improved water quality. On an acreage basis, 89 percent (193,424 acres) of the 217,250 assessed acres fully supported uses, while 9 percent partially supported uses, and 2 percent did not support one or more uses (Figure IV).

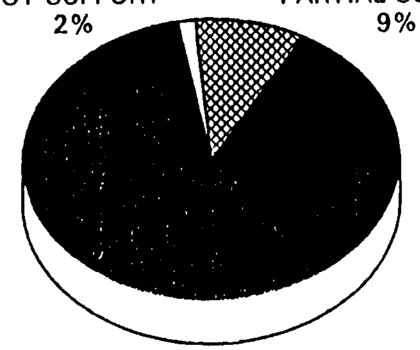
Nutrients were the greatest cause of uses in lakes not being fully supported and was the cause affecting the largest number of lakes. Agricultural runoff and septic tanks were the principal sources of the nutrients. Naturally shallow lake basins, which allow the proliferation of nuisance aquatic weeds that impair secondary contact recreation, accounted for the second greatest cause of use nonsupport. Other natural conditions such as shallow lake basins, manganese releases from anoxic hypolimnetic waters, and nutrients in runoff from unimpacted watersheds affected secondary contact and domestic water supply uses, respectively. Suspended solids from surface mining activities impaired the secondary contact recreation use in fewer eastern Kentucky reservoirs than previously reported. Figure V shows causes and sources of use nonsupport in lakes.

An analysis of lake trophic status indicated that of the 103 lakes assessed, 61 (59%) were eutrophic, 33 (32%) were mesotrophic, and 9 (9%) were oligotrophic. One-half of the lake acres assessed were eutrophic. Of the rest, 22 percent were mesotrophic and 28 percent were oligotrophic (Figure VI). Fishtrap, Martins Fork, and Grayson lakes changed from an oligotrophic state to a mesotrophic state, which accounts for the major changes in trophic status from the 1992 305(b) report.

The envelope on the back inside cover of this report contains color-coded maps illustrating use support by major river basins. The maps include all streams and all but a few of the smaller lakes that were assessed.

Figure IV

SUMMARY OF LAKE USE SUPPORT



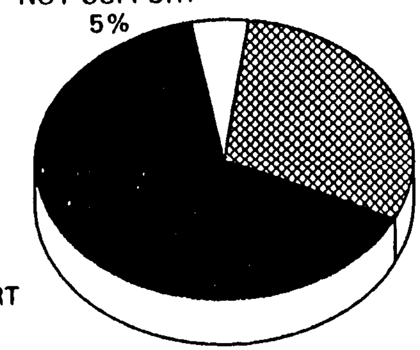


Figure V

USE NONSUPPORT IN LAKES BY SIZE (ACRES)

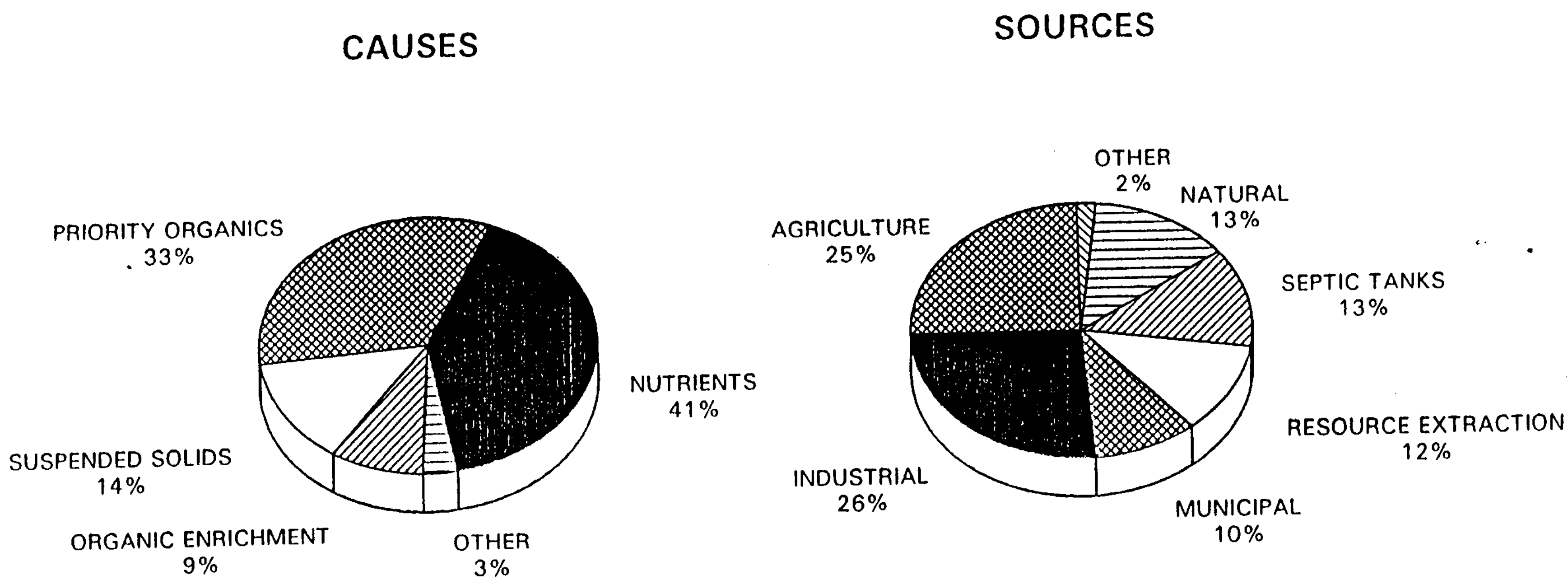
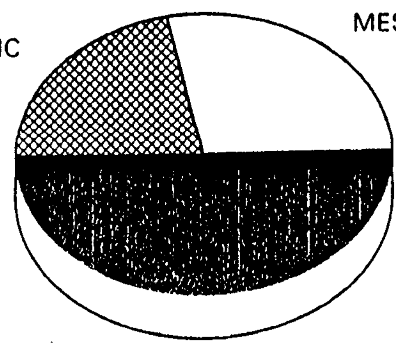


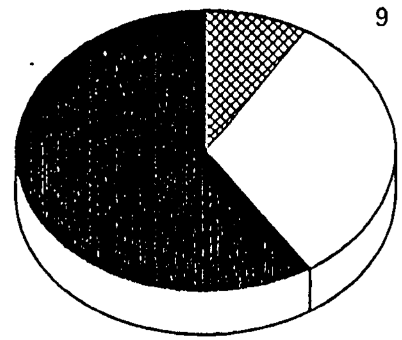
Figure VI

SUMMARY OF LAKE TROPHIC STATE

BY SIZE (ACRES)



BY NUMBER



Underground storage tanks, septic tanks, abandoned hazardous waste sites, agricultural activities, and landfills are estimated to be the top five sources of groundwater contamination in Kentucky. Improper well construction is no longer one of the top five priorities because new programs instituted by the DOW ensure safe well construction standards. Bacteria was the major pollutant of groundwater during this reporting period.

Lack of groundwater data, the absence of groundwater regulations, and the potential for groundwater pollution in karst regions are three of the areas of special concern in the groundwater program.

Water Pollution Control Programs

Kentucky's water pollution control programs continued to develop approaches for controlling pollution. Permitting of combined sewer overflows (CSOs) and stormwater outfalls was initiated in the summer and fall of 1991 and proceeded throughout this 305(b) reporting period. By the end of 1993, 79 municipal and 40 industrial wastewater treatment facilities had KPDES permit requirements for whole effluent toxicity testing. The DOW conducted acute and chronic toxicity tests on 49 point source discharges in 1992 and 1993. A total of 1,731 tests were conducted by permitted facilities. Approximately three-fourths of facilities are in compliance with their toxicity limits, and about one-fourth are conducting toxicity identification/reduction evaluations to reduce the toxicity of their effluents. Fourteen facilities completed the toxicity reduction/identification process by the end of 1993.

Pretreatment programs have been approved in 71 cities to better treat industrial wastes flowing into publicly owned treatment works. New programs were approved and implemented in three municipalities. Other municipalities needing pretreatment programs are on schedule for obtaining approval.

A state revolving fund program has continued to help meet the needs of wastewater treatment plant construction. Twenty-six municipal wastewater treatment projects were completed in 1992-93, and another 25 are being constructed. These projects have either replaced outdated or inadequate treatment facilities, or have provided a centralized treatment system for the first time.

The Nonpoint Source (NPS) program is providing oversight and (Clean Water Act) Section 319 grant funds for fifty-five projects. These projects address watershed remediation, education, training, best management practice evaluation, and technical assistance. Kentucky's NPS program has received a total of $5.6 million through five 319 grants from EPA since 1990.

The NPS program is also monitoring water quality in four watersheds with NPS pollution remediation demonstration projects. The Mammoth Cave, Upper Salt River/Taylorsville Lake, and Fleming Creek projects involve agricultural pollution remediation throughout the entire watershed.

Biologists in the NPS program are cooperating with personnel in the Tennessee NPS Program by conducting water quality monitoring in the Bear Creek interstate watershed. Acid mine drainage in this watershed of the Big South Fork Cumberland River is being remediated by Tennessee agencies. These are long-term studies to determine nonpoint source impacts and demonstrate water quality improvements from best management practices.

Education efforts in the NPS program are producing several noteworthy achievements. A slide/video program on pollution problems from nonpoint sources in Kentucky was produced under contract with Western Kentucky University. Funding was awarded to the American Cave and Conservation Association to assist in developing NPS-related exhibits at its American Museum of Caves and Karstlands located in Horse Cave. Funding also was awarded to Western Kentucky University for development of an educational video program on abandoned mine lands and water quality.

An updated list of streams, rivers, lakes, wetlands, and groundwater impacted by nonpoint sources of pollution is presented in Appendix E. Current information regarding sources and parameters of concern is included in the appendix.

BACKGROUND

BACKGROUND

This report was prepared by the Kentucky Division of Water (DOW) to fulfill the requirements of Section 305(b) of the Federal Water Pollution Control Act of 1972 (P.L. 92-500) as amended by the Clean Water Act of 1987 (P.L. 100-4). Section 305(b) requires that every two years states submit to the U.S. Environmental Protection Agency (EPA) a report addressing current water quality conditions. This report generally assesses data collected in 1992 and 1993 using EPA guidelines provided to the states in 1993. Items addressed in the report include: 1) monitoring programs and data sources; 2) water quality conditions and use support of streams rivers, and lakes; 3) wetlands issues; 4) groundwater issues; 5) water pollution control programs; and 6) recommendations on actions necessary to achieve the goals and objectives of the Clean Water Act. EPA uses the reports from the states to apprise Congress of the current water quality of the nation's waters and to recommend actions that are necessary to achieve improved water quality. States use the reports to provide information on water quality conditions to the general public and other interested parties and to help set agency pollution control directions and priorities.

Kentucky is divided into 42 USGS cataloging units, which compose the 13 major river basins assessed in this report. These drainage basins (from east to west) are the Big Sandy, Little Sandy, Tygarts, Licking, Kentucky, Upper Cumberland, Salt, Green, Tradewater, Lower Cumberland, Tennessee, and Mississippi. The Ohio River minor tributaries were also assessed by the DOW. The Ohio River Valley Water Sanitation Commission (ORSANCO) provided an assessment summary of the Ohio River mainstem. The DOW has subdivided the cataloging units into smaller, discrete hydrologic units called waterbodies. The smaller units are useful for assessment and management purposes. There are 759 waterbodies, of which 105 are lakes. Water quality assessment information on these waterbodies is stored in a computer software package called the waterbody system (WBS). The software was developed by Research Triangle Park under guidance of EPA and several states. Kentucky was one of the states involved in the testing and development of the WBS software.

The assessment of lake conditions is based on data collected by the DOW in 1992 and 1993 through a lake assessment project funded under the federal Clean Lakes Program and from other current monitoring data. The 103 lakes that were assessed have a total area of 217,250 acres and make up more than 90 percent of the publicly owned lake acreage in the state. This includes the Kentucky portions of Barkley, Kentucky, and Dale Hollow lakes, which are border lakes with Tennessee. An EPA estimate made in 1993 of the number of lakes in the state is based on lakes shown on the 1:100,000 scale base map and separates lakes into two groups by size. According to those estimates, Kentucky has 2,721 lakes. Of the total, 1,768 are less than 10 acres and 953 are 10 acres or greater in size.

The DOW, in collaboration with the Kentucky Department of Fish and Wildlife Resources (KDFWR), contracted with the U.S. Fish and Wildlife Service to map wetlands in the Commonwealth. According to these estimates, Kentucky has a total of 836,871 acres of wetlands of all types, including those classified as deep water. The palustrine wetland acreage of 441,480 reported in this 305(b) report is considered more accurate than the estimate of 637,000 reported in 1992.

Kentucky's population at the time of the 1990 census was 3,685,296. The state has an approximate area of 40,598 square miles. It is estimated that there are approximately 89,431 miles of streams within the borders of Kentucky. That figure was determined from the Kentucky Natural Resources Information System, which has a computerized geographic database. All of the blue-line streams on the 7.5 minute (1:24,000) USGS topographic maps were digitized to produce the figure. Main channel and tributary river miles in reservoirs are included. EPA estimates from their Reach File 3 that there are 49,105 miles of streams in the state shown on USGS 1:100,000 scale maps. Of these stream miles, 18,745 are in Kentucky's assessment base, and 15,892 were assessed for this report. Kentucky has 855 miles of border rivers. The northern boundary of Kentucky is formed by the low water mark of the northern shore of the Ohio River, and extends 664 miles along the river from Catlettsburg, Kentucky in the east to the Ohio's confluence with the Mississippi River near Wickliffe in the west. The southern boundary is formed by an extension of the Virginia-North Carolina 1780 Walker Line which extends due west to the Tennessee River. Following the acquisition of the Jackson Purchase in 1818, the 36°30' parallel was accepted as the southern boundary from the Tennessee River to the Mississippi River.

Kentucky's eastern boundary begins at the confluence of the Big Sandy River with the Ohio River at Catlettsburg and follows the main stem of the Big Sandy and Tug Fork southeasterly to Pine Mountain, for a combined length of 121 miles, then follows the ridge of the Pine and Cumberland mountains southwest to the Tennessee line. The western boundary follows the middle of the Mississippi River for a length of 71 miles and includes several of the islands in the Mississippi channel. A listing of the above information is provided in Table I.

The climate of Kentucky is classified as continental temperate humid. Summers are warm and humid with an average temperature of 76°F, while winters are moderately cold with an average temperature of 34°F. Annual precipitation averages about 45 inches, but varies between 40 to 50 inches across the state. Maximum precipitation occurs during winter and spring and minimum precipitation occurs in late summer and fall.

Table I. Atlas

State population (1990 census)	3,685,296
State surface area (square miles)	40,598
Number of major river basins	13
Total number of river miles*	89,431
Number of river miles in EPA Reach File 3**	49,105
Number of miles in assessment base	18,745
Number of miles assessed***	15,892
Number of river border miles (subset)	855
Number of lakes/reservoirs	2,721
Number of lakes 10 acres or greater in size	953
Total acres of lakes/reservoirs	Unknown
Number of publicly owned lakes/reservoirs assessed	103
Lake acres assessed	217,250
Wetland acres	836,871
Total palustrine wetland acres	441,480

* from 1:24,000 scale USGS maps; includes reservoir main channel and tributary channel miles
** from 1:100,000 scale USGS maps
*** includes 664 miles of the Ohio River assessed by ORSANCO

Summary of Classified Uses

Kentucky lists waterbodies according to specific uses in its water quality standards regulations. These uses are Warmwater Aquatic Habitat, Coldwater Aquatic Habitat, Domestic Water Supply, Primary Contact Recreation, Secondary Contact Recreation, and Outstanding Resource Waters. Those waters not specifically listed are classified (by default) for use as Warmwater Aquatic Habitat, Primary and Secondary Contact Recreation, and Domestic Water Supply. The Domestic Water Supply use is applicable at points of public and semipublic water supply withdrawals. The DOW adds waterbodies to the regulation list as an ongoing process in its revision of water quality standards. Intensive survey data and data from other studies, when applicable, are used to determine appropriate uses. Currently, 4,252.7 stream miles are listed as warmwater aquatic habitat, 400.8 miles as coldwater aquatic habitat, 699.9 miles as outstanding resource waters, and 5,081.3 miles as primary and secondary contact recreation. By default, more than 84,000 miles are classified for the uses of Warmwater Aquatic Habitat, Primary and Secondary Contact Recreation, and Domestic Water Supply (if applicable). There are approximately 110 domestic water supply intakes in streams and another 79 intakes in 54 lakes. Twenty-nine lakes have been classified for specific uses in the water quality standards regulations.

CHAPTER 1

WATER QUALITY ASSESSMENT OF RIVERS AND STREAMS

WATER QUALITY ASSESSMENT OF RIVERS AND STREAMS

Surface Water Monitoring Program

An effective water monitoring program is essential for making sound pollution control decisions and for tracking water quality improvements. Specifically, the Division of Water's (DOW) ambient monitoring program provides monitoring data to identify priority waterbodies upon which to concentrate agency activities, to revise state water quality standards, to aid in the development of wasteload allocations, and to determine water quality trends in Kentucky surface waters. As outlined in the Kentucky Ambient Surface Water Monitoring Strategy (DOW, 1986) the major objectives associated with the Ambient Monitoring Program are:

1. To operate a fixed-station monitoring network meeting chemical, physical, and biological data requirements of the state program and EPA's Basic Water Monitoring Program (BWMP).

2. To conduct intensive surveys on priority waterbodies in support of stream use designations, wasteload allocation model calibration/verification, and other agency needs.

3. To store data in EPA's STORET system, a computerized water quality data base.

4. To coordinate ambient monitoring activities with other agencies (EPA, Ohio River Valley Water Sanitation Commission, U.S. Geological Survey, U.S. Army Corps of Engineers, etc.).

Following is a discussion of components of the monitoring program, consisting of fixed-station monitoring, biological monitoring, intensive surveys, reference reaches, citizens' Water Watch Program, and Volunteer Stream Sampling projects. Elements of the toxicity testing program relating to surface waters are also discussed.

Fixed-Station Monitoring Network

The physicochemical monitoring network consisted of 44 stream stations located in 10 river basins. In this period some stations were deleted, others relocated, and some new stations were established based on a review of monitoring objectives. Table 1-1 lists stations sampled, and Figure 1-1 depicts station locations. Samples were collected monthly at each station for the constituents listed in Table 1-2. Excluding the mainstem of the Ohio River, water quality information generated by the fixed-station network was used to characterize 1,432 stream miles within the state.

Table 1-1
Fixed-Station Monitoring Network

Map No.	Station Name	RMI	Road Location
1	Tug Fork at Kermit	35.1	KY 40
2	Levisa Fork near Louisa	29.6	KY 644
3	Levisa Fork near Pikeville	114.6	KY 1426
4	Little Sandy River near Argillite	13.2	KY 1
5	Tygart's Creek near Load	28.1	KY 7
6	Kinniconick Creek near Tannery	10.4	KY 1149
7	Licking River at Claysville	78.2	US 62
8	N. Fork Licking River at Milford	6.9	KY 19
9	S. Fork Licking River at Morgan	11.7	KY 1054
10	Licking River at West Liberty	226.4	US 460
11	Kentucky River at Frankfort	66.4	St. Clair St. Bridge
12	Kentucky River at Camp Nelson	135.1	Old US 27
13	Eagle Creek at Glencoe	21.5	US 127
14	South Elkhorn Creek near Midway	25.3	Moores Mill Rd. Bridge
15	Dix River near Danville	34.6	KY 52
16	Red River at Clay City	21.6	KY 11/15
17	Kentucky River at confluence with Red River	191.2	-
18	N. Fork Kentucky River at Jackson	304.5	Old KY 30
19	M. Fork Kentucky River at Tallega	8.3	KY 708
20	S. Fork Kentucky River at Booneville	12.1	KY 28
21	Salt River at Shepherdsville	22.9	KY 61
22	Salt River at Glensboro	82.5	KY 53
23	Rolling Fork near Lebanon Junction	12.3	KY 434
24	Beech Fork near Maud	48.1	KY 55
25	Pond Creek near Louisville	15.5	Manslick Rd. Bridge
26	Green River near Island	74.4	KY 85
27	Pond River near Sacramento	12.4	KY 85
28	Rough River near Dundee	62.5	Barrets Ford Bridge
29	Mud River near Gus	17.4	KY 949
30	Barren River at Bowling Green	37.5	College St. Bridge
31	Green River at Munfordville	225.9	US 31W
32	Nolin River at White Mills	80.9	White Mills Bridge
33	Bacon Creek near Priceville	7.2	C. Avery Rd. Bridge
34	Tradewater River near Sullivan	15.1	US 60/641
35	Little River near Cadiz	24.4	KY 272
36	Cumberland River at Turkey Neck Bend	393.7	KY 214 Ferry Crossing
37	S. Fork Cumberland River at Blue Heron	44.7	Old Rail Bridge
38	Rockcastle River at Billows	24.4	Old KY 80
39	Horse Lick Creek near Lamero	7.5	Daugherty Rd. Ford
40	Cumberland River at Cumberland Falls	562.3	KY 90
41	Cumberland River at Pineville	654.4	Pine St. Bridge
42	Clarks River at Almo	53.5	Almo-Shiloh Rd. Bridge
43	Mayfield Creek near Magee Springs	10.8	KY 121
44	Bayou de Chien near Clinton	15.1	US 51

Figure 1-1

Fixed-Station Monitoring Network

Stream Station Locations

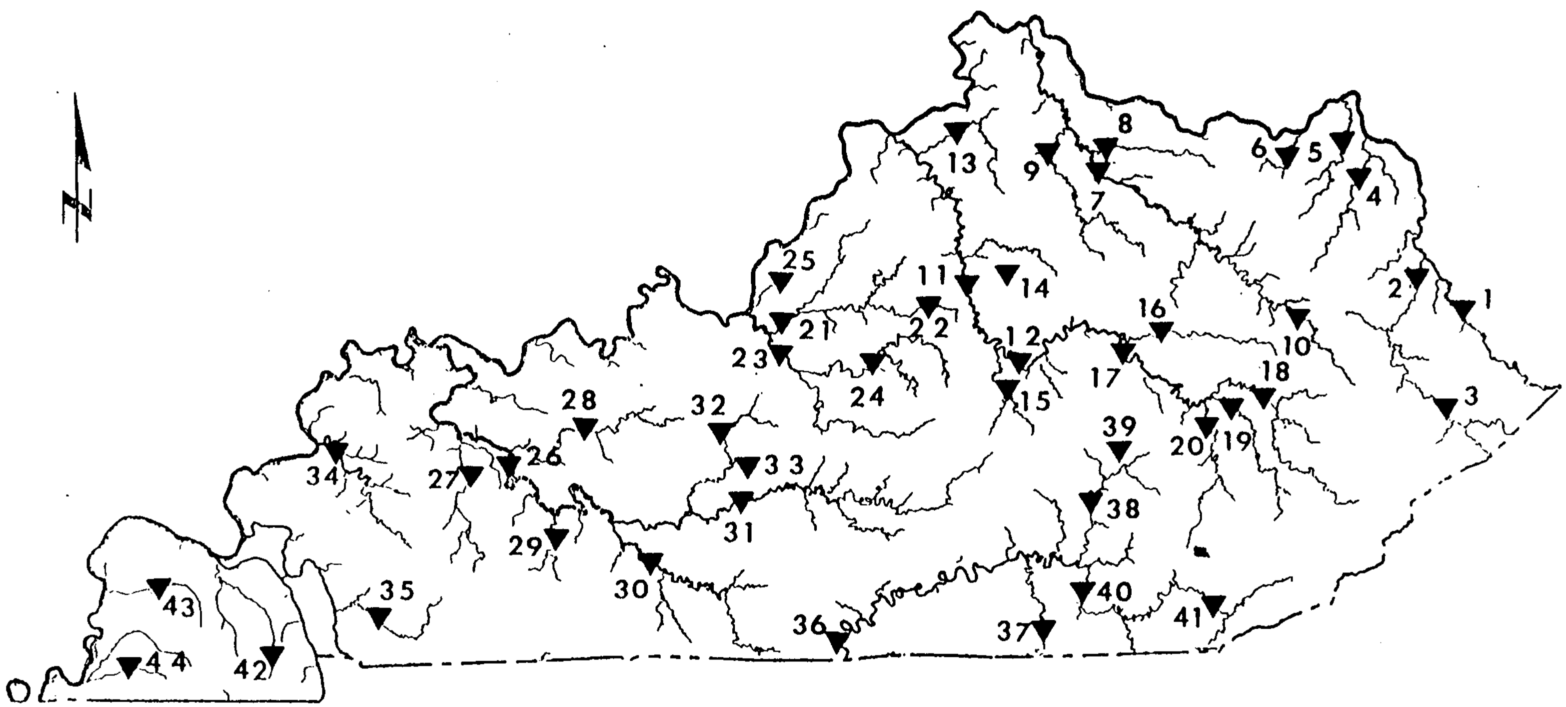


Table 1-2
Stream Fixed-Station Variable Coverage

Field Data	Laboratory Data
Weather code (47501)*	Alkalinity, mg/l (00410)
Air temp, °C (00020)	Chloride, mg/l (00940)
Water temp, °C (00010)	Sulfate, dissolved mg/l (00946)
Specific conductance, uS/cm @ 25C (00094)	Suspended solids, mg/l (00530)
D.O., mg/l (00300)	TOC, mg/l (00680)
pH, S.U. (00400)	
Turbidity, N.T.U. (82078)	
Flow, cfs (00061)	
Minerals, Total**	**Metals, Total***
Calcium, mg/l (00916)	Aluminum, ug/l (01105)
Magnesium, mg/l (00927)	Arsenic, ug/l (01002)
Potassium, mg/l (00937)	Barium, ug/l (01007)
Sodium, mg/l (00929)	Cadmium, ug/l (01027)
Hardness, mg/l (00900)	Chromium, ug/l (01034)
	Copper, ug/l (01042)
Bacteria	Iron, ug/l (01045)
	Lead, ug/l (01051)
Fecal coliform, colonies per 100 ml (31616)	Manganese, ug/l (01055)
	Mercury, ug/l (071900)
Nutrients	Zinc, ug/l (01092)
NH_3-N, mg/l (00610)	
NO_2 + NO_3-N, mg/l (00630)	
TKN, mg/l (00625)	
Total phosphorus, mg/l (00665)	

*STORET codes are in parentheses
**Total as Total Recoverable

In addition to water quality information generated by the state's fixed-station network, the DOW supports and uses information collected by the Ohio River Valley Water Sanitation Commission (ORSANCO) at five major tributary stations. These stations include:

Cumberland River at Pinckneyville, Tennessee River at Paducah, Green River near Sebree, Licking River at Covington, and Big Sandy River near Louisa. The DOW also uses information from stations maintained as part of the U.S. Geological Survey's (USGS) current monitoring programs.

Lake monitoring under the ambient monitoring program addressed three objectives in 1992 and 1993. First, several lakes were sampled to evaluate problems of accelerated eutrophication. Second, Lake Cumberland was monitored to determine impacts from a diffuser that began discharging effluent from the Russell County Regional Wastewater Treatment Plant. Third, two lakes were monitored to quantify and describe impacts on water clarity and use impairment caused by suspended solids entering the lakes from surface mining activities. Dewey Lake was previously monitored for this purpose in 1991. Lakes in the ambient monitoring program are listed in Table 1-3, and the parameters measured are in Table 1-4.

Biological Monitoring

Kentucky's biological monitoring program currently consists of a network of 48 stations located in 12 river basins. In 1993, the network was expanded to include stations on eight of the nine Kentucky Wild Rivers. Data collected from these stations are used to ensure that existing water quality is maintained, provide background values against which future water quality conditions can be compared, and recognize emerging problems in the areas of toxic chemicals, bacteriological contamination, and nuisance biological growth. Program emphasis is directed at evaluating warmwater aquatic habitat (WAH) use support, determining presence and concentration of contaminant residues in fish tissue and sediments, and evaluating municipal and industrial effluents for toxic conditions. The information from these monitoring efforts also defines existing aquatic life, helps determine necessary protective measures for aquatic life, and is used in developing the 305(b) report. For this report, biological data from 24 sites sampled from 1992-1993 were used to assess 516.8 miles of streams for WAH use. Biological monitoring station locations and multiple assemblage assessments are outlined in Table 1-5.

On the basis of the biological monitoring program, the WAH use was supported in 294.4 miles, supported but threatened in 48.3 miles, partially supported in 157.1 miles, and not supported in 17.0 miles. Causes of threat or impairment were siltation, organic enrichment, or nutrients. Sources were silviculture, nonpoint source agricultural runoff, municipal point sources, and habitat modification. The Pond Creek site in Jefferson County showed nonsupport of the WAH use during the 1992-1993 period.

Table 1-3
Lake Ambient Monitoring Network

Lake	Station Location
Monitored for Eutrophication Trends	
Reformatory	Dam
McNeely	Dam
Cumberland Big Lily Creek Embayment Main Lake (also monitored for diffuser impact)	Pitman Creek Embayment
Laurel River Upper Lake Area Craig Creek Arm	Dam
Taylorsville Heddy Branch Area Below Van Buren Above Van Buren	Dam
Martins Fork	Dam Mid Lake Area Martins Fork Arm Cranks Creek Arm
Cranks Creek	Dam Upper Lake (Also monitored for AMD impacts)
Monitored for Suspended Solids/Recreation Impact	
Martins Fork	Same sites as above
Fishtrap Mid Lake Upper Lake	Dam
Dewey (1991) Mid Lake Dicks Creek Area	Dam

Table 1-4
Lake Ambient Monitoring Parameters

Parameters	**EUT***	**REC****
Dissolved oxygen	X	
Temperature	X	
pH	X	
Specific conductance	X	
Depth of euphotic zone	X	X
Alkalinity	X	
T. phosphorus	X	
T. soluble phosphorus	X	
Orthophosphate	X	
Ammonia-N	X	
Nitrite & nitrate-N	X	
T. Kjeldahl-N	X	
Chlorophyll a	X	
Secchi depth	X	X
Turbidity		X
Total suspended solids		X

*EUT - lake eutrophication evaluation
**REC - recreation impact evaluation

Table 1-5
Biological Monitoring Station Locations
and Sampling Coverage (1992-1993)

Station	Miles Assessed	Algae	Macro-invertebrate	Fish	Combined Bioassessment	Other
Big Sandy River Basin	**83.9**					
Tug Fork	26.0	P	P	P	P	X
Levisa Fork	32.3	S	P	S	P	X,T
Levisa Fork	15.6	S	P	O	P	X
Licking River Basin	**179.4**					
Licking River	35.2	S	S	S	S	X
Licking River	12.9	S	S	P	S	X
South Fork Licking River	15.6	S	S	S	S	X
North Fork Licking River	31.8	S	S	P	S	X
Salt River Basin	**94.0**					
Salt River	13.8	P	P	P	P	X
Salt River	10.5	P	P	S	P	X
Pond Creek	17.0	N	N	O	N	X
Beech Fork	10.2	S	S	S	S	X,T
Rolling Fork	42.5	S	S	P	S	X,T

Table 1-5 (Continued)

Station	Miles Assessed	Algae	Macro-invertebrate	Fish	Combined Bioassessment	Other
Upper Cumberland River Basin	**150.8**					
Big South Fk. Cumberland	6.2	S	S	S	ST	X
Cumberland River	37.0	S	S	S	S	X
Rockcastle River	32.8	S	S	S	ST	X
Buck Creek	20.8	S	S	S	S	X
Horselick Creek	21.2	S	S	S	S	X
Little So. Fk. Cumberland	9.3	S	S	S	ST	X
Rock Creek	18.0	S	S	S	S	X
Martins Fork	5.5	S	S	O	S	X
Lower Cumberland River Basin	**37.4**					
Little River	37.4	S	P	P	P	X
Mississippi River de Basin	**43.7**					
Bayou de Chien	11.9	S	S	S	S	X
Mayfield Creek	31.8	S	S	P	S	X
Tennessee River Basin	**21.5**					
Clarks River	21.5	P	P	O	P	X

S = Supports WAH Use, ST = Supports WAH, but threatened, P = Partially Supports WAH, 0 = Not Sampled, N = Does not support WAH, X = Sediments collected, T = Fish tissue collected

Intensive Surveys

Kentucky uses the intensive survey to evaluate site-specific water quality problems. Information developed from intensive surveys is essential in providing information to:

- o Document the attainment/impairment of designated water uses
- o Verify and justify construction grants decisions
- o Address issues raised in petitions for water quality standards variances or use redesignations
- o Document water quality improvements and progress resulting from water pollution control efforts
- o Establish base-line biological data required for permit requirements and establishment of standards

In 1992-1993, six intensive surveys were conducted on 69.7 miles of streams. The locations, purposes, and conclusions of these surveys are summarized in Table 1-6. Using primarily the biological data, 53.8 stream miles were determined to be supporting designated uses, 2.5 stream miles were partially supporting designated uses, and 13.4 miles of stream were not supporting designated uses. These assessments were pooled with other existing information to arrive at the final use-support decisions.

Reference Reach Program

The DOW began a program to gather physical, chemical, and biological data from unimpacted or least impacted streams and wetlands in 1991. The program looks at candidate waters as representative of geographical regions of the state known as ecoregions. This information allows a comparison with other stream data and defines the physical, chemical, and biological potentials for the streams of a particular ecoregion. These reference reach sites provide the information needed to document water quality in unimpacted or least impacted streams, which can determine the potential legitimate uses of other streams in the same region. The data from this program will provide the basis for the development of narrative and numerical biocriteria for the various ecoregions of the Commonwealth. Data on chemical water quality, sediment quality, fish tissue residue, habitat condition, and biotic conditions are being collected.

Fifty-five stream sites from seven proposed ecoregions were sampled in the spring and fall of 1992-93 under the Reference Reach Program. From those, a total of 45 sites have been included into the Reference Reach Program. Data from 40 sites were assessed for this report, resulting in 514.5 stream miles supporting the WAH use. Spring and fall collections will continue in order to increase the biological data base from undisturbed streams that can be used to compare with impacted streams. At the same time, program personnel will continue to develop and refine the necessary metrics used to evaluate the relationships between biotic communities and habitat conditions in streams and wetlands across Kentucky.

Table 1-6
List of Intensive Surveys Conducted During FY 1992 - 1993

Waterbody Number/ Stream Name	Survey Purpose	Year Surveyed	Total Miles Assessed	Miles Supporting Use	Miles Partially Supporting Uses	Miles Not Supporting Uses	Conclusions
Ohio River Drainage							
KY5090203-004 Elijah's Creek	To document effects of ethylene glycol on local waters	1993	6.5		1.5	5.0	Ethylene glycol from airplane de-icing operations enters surface waters during rain events and has degraded the aquatic community.
Kentucky River Drainage							
KY5100205-054 Boone Creek	To determine the baseline water quality of this system.	1992	24	19.1		4.9	Nutrients arising from both point and non-point sources are potential problems.
Green River Drainage							
KY5110001-028 South Fork Russell Creek	To determine the impact of oil well brines on a small stream system.	1993	8.0	7.4	0.6		The discharge of oil well brines to small streams seriously degrade the aquatic environment.

Table 1-6 (Continued)

Waterbody Number/ Stream Name	Survey Purpose	Year Surveyed	Total Miles Assessed	Miles Supporting Use	Miles Partially Supporting Uses	Miles Not Supporting Uses	Conclusions
Cumberland River Drainage							
KY 5130101-009 Cumberland River Wild River Segment	To determine baseline water quality.						Though the water quality is good, upstream mining activities could again degrade the aquatic environment if not done in accordance with appropriate permits.
KY5130103-011 Big Lily Creek	To determine the present impact and future recovery of this system from a mixture of domestic and industrial waste.	1993	7	4.4		2.6	The combination of domestic and industrial waste has degraded the lower portion of this system.
Salt River Drainage KY 5140102-003 Mill Creek	To determine the impact of a privately owned waste treatment plant on a portion of the headwaters of Mill Creek	1993	8.4	7.1	1.0	0.3	Excessive chlorination and poorly treated waste are impacting a portion of the headwaters of Mill Creek.

Citizens Water Watch Program

The Kentucky Water Watch program is administered by the DOW. Initiated in 1985, Water Watch promotes individual responsibility for a common resource, educates Kentuckians about the wise use and protection of local water resources, provides a recreational opportunity through group activities, and gives citizens more access to their government. Objectives include promoting individual responsibility for a common resource by fostering a public role in drawing attention to specific problems, enhancing citizen understanding and support through a strong program of public education, and communicating the value of environmental quality in attracting industry and tourism to the state. The DOW promotes the program by encouraging citizens to form groups that "adopt" waterbodies of local interest.

After a group is formed, members identify the stream, lake, or wetland they want to adopt and submit an "adoption" form for approval to the DOW. After the adoption is approved, the Water Watch group then promotes community awareness and protection of its adopted water resource through stream monitoring, school-based programs, and stream rehabilitation projects.

Each group receives training from the DOW's program coordinator as well as educational resources. The latter include a Water Watch Program Manual and two field guides (A Field Guide to Kentucky's Lakes and Wetlands and A Field Guide to Kentucky's Rivers and Streams).

Since its beginning, more than 345 groups have been established with more than 1,680 volunteers statewide, and approximately 24,000 people have received a two-hour training program on basic stream monitoring. More than 300 streams, 35 lakes, 30 wetlands, and nine karst or underground systems have been adopted. Advanced training workshops for volunteers are also offered from time to time.

Volunteer Stream Sampling Project

The Water Watch Program initiated a Volunteer Stream Sampling Project in 1987. The objectives were to assist local groups in developing information concerning the quality of water resources close to them, to gather information about stream segments not covered by the existing Kentucky Ambient Water Quality Monitoring Network, and to educate the public about the condition and importance of Kentucky's water resources.

To date, the project has recruited more than 180 volunteer teams consisting of more than 500 volunteers to conduct regular water quality tests on streams in their communities. Although the information obtained cannot be used in enforcement action, citizen monitoring can and has provided useful "flagging" of water quality problems. Remedial action has occurred as a result of these efforts.

The teams are equipped with commercial water testing kits for measuring dissolved oxygen, pH, temperature, nitrate-nitrogen, total settleable solids, iron, and chloride. Volunteers are trained in testing and reporting procedures, quality control, and interpretation of results. Training also involves discussing ways the information can be shared through various organizations and media outlets.

Recruited groups have agreed to perform monthly tests on at least two designated sites in their community for one year. The volunteers submit the results to the DOW, usually within one week after the tests are performed. The results are tabulated, summarized, and reported back to the groups.

The project is producing site data from more than 200 stations on streams in seven of Kentucky's 13 major river basins. The program is administered on a continuing basis by the Water Watch Program Coordinator at the DOW as a part of the overall Water Watch Program. New sites are being added continuously. Local groups, civic organizations, schools, and businesses contribute to the project.

Public Outreach

The Kentucky Legislature appropriated $100,000 in the 1992-94 biennium for matching grants to twenty local governments to "promote community and local government partnerships in restoring, maintaining, and enhancing local and regional river resources and their accompanying watershed, streams and riparian areas." Known as the "Community Rivers and Streams Grants," this program is administered by the Department of Local Government with technical support provided by the DOW.

Urban watershed groups working for river resource protection have recently been formed across Kentucky. These groups are concentrating on education, water quality monitoring, water quantity, and riparian habitat protection. Most of these watershed groups are members of the newly created "Kentucky Waterways Alliance," a state-wide coalition of local organizations and individual citizens who have come together to promote networking, project support, education, and advocacy. The DOW is providing ongoing support for these local efforts.

An international "Sisters Rivers" project, designed to promote partnerships of community-based river groups from different countries, was created by the DOW in 1993. The project seeks to pair citizens from watersheds in Kentucky with citizens from similar watersheds in other countries. Participants share common problems, ideas, and solutions to water-related issues.

<u>Methods of Assessment</u>

Water quality data collected by the DOW, Kentucky Division of Waste Management, ORSANCO, COE, and the USGS were used to determine stream use support status. Other sources of information used in this determination include biological studies at fixed stations, intensive surveys, and data supplied by the Kentucky Department of Fish and Wildlife Resources. The data were categorized as "monitored" or "evaluated." Monitored data were derived from site specific ambient surveys and were generally no more than five years old. In some instances where watershed conditions remained unchanged, monitored data collected prior to 1989 were still considered valid and streams described by that data were categorized as monitored. Evaluated data were from other sources or from ambient surveys that were conducted more than five years ago. The criteria for assessing these data to determine use support are explained below.

Water Quality Data

Chemical data collected by the DOW, ORSANCO, and the USGS at fixed stations were evaluated according to EPA guidelines for the preparation of this report. Water quality data were entered into EPA's national storage and retrieval (STORET) database and compared to criteria as noted in Table 1-7. All of the criteria in the table, except fecal coliform, were used to assess Warmwater Aquatic Habitat (WAH) use support. The segment fully supported the WAH use when criteria for dissolved oxygen, un-ionized ammonia, temperature, and pH were exceeded in 10 percent or less of the samples collected from October 1991 through September 1993. Partial support was indicated if any one criterion for these parameters was exceeded 11-25 percent of the time. The segment was not supporting if any one of these criteria was exceeded more than 25 percent of the time.

Data for mercury, cadmium, copper, lead, and zinc were analyzed for violations of acute criteria listed in state water quality standards using three years of data (from October 1990 through September 1993). The segment fully supported its use if no criteria were exceeded at stations with quarterly or less frequent sampling or if only one violation occurred at stations with monthly sampling. The segment was not supporting if criteria were exceeded in one or more samples taken quarterly or less frequently, or criteria were exceeded in two or more samples at monthly monitored stations. These assessment criteria were also used in the 1992 305(b) report. They are closely linked to the way state water quality criteria were developed. Aquatic life are considered to be protected if the acute criteria are not exceeded more than once every three years on the average.

Fecal coliform data were used to indicate the degree of support for Primary Contact Recreation (swimming) use. The Primary Contact Recreation use was fully supported if the criterion was exceeded in 10 percent or less of the measurements, partially supported if the criterion was exceeded in 11-25 percent of the measurements, and not supported if the criterion was exceeded more than 25 percent of the time. In addition, streams with pH below 6.0 units were judged to not support this use. Domestic Water Supply use was not assessed because the use is applicable at points of withdrawal only and could not be quantified in the format required by the guidelines. In areas where both chemical and biological data were available, the biological data were generally the determinate factor for establishing WAH use support status. This is especially true when copper, lead, or zinc criteria were contradicted by biological criteria. The DOW made this decision in recognition of the natural ability of surface waters to sequester metals, making them less bioavailable by reducing the toxic fraction.

Table 1-7
Physical and Chemical Parameters and Criteria Used to Determine Use Support Status at Fixed Stations

Parameter	Criterion*
Dissolved oxygen	<4.0 mg/l
Temperature	30°C
pH	6 to 9 units
Un-ionized ammonia-N	0.05 mg/l
Mercury	2.4 ug/l
Cadmium	$e^{(1.128 \ln x - 3.828)}$ **
Copper	$e^{(.9422 \ln x - 1.464)}$
Lead	$e^{(1.273 \ln x - 1.460)}$
Zinc	$e^{(.8473 \ln x + .8604)}$
Fecal coliform	400 colonies/100 ml (May 1 thru Oct. 31)

* from Kentucky Water Quality Standards
** x = hardness in mg/l as $CaCO_3$

Fixed-Station Biological Data

Biological data for 1992-1993 were collected from 24 fixed monitoring network stations in seven drainage basins throughout the state. Algae, macroinvertebrates, and fish were collected, and several community structure and function metrics were analyzed for each group of organisms. These metrics were used to determine biotic integrity, water quality, and designated use support for each stream segment monitored. Expectations for metric values are dependent upon stream size, ecoregion, and habitat quality and were applied accordingly. Bioassessments integrated data from each group of organisms, habitat data, selected physical and chemical parameters, and professional judgement of aquatic biologists (Table 1-8).

Table 1-8
Biological Criteria for Assessment of Warmwater Aquatic Habitat (WAH) Use Support

	Fully Supporting	Partially Supporting	Not Supporting
Algae	Diatom Bioassessment Index (DBI) classification of excellent or good, biomass similar to reference/control or STORET mean.	DBI classification of fair, increased biomass (if nutrient enriched) of filamentous green algae.	DBI classification of poor, biomass very low (toxicity), or high (organic enrichment).
Macroinvertebrate	Macroinvertebrate Bioassessment Index (MBI) excellent or good, high EPT, sensitive species present.	MBI classification of fair, EPT lower than expected in relation to available habitat, reduction in RA of sensitive taxa. Some alterations of functional groups evident.	MBI classification of poor, EPT low, TNI of tolerant taxa very high. Most functional groups missing from community.
Fish	Index of Biotic Integrity (IBI) excellent or good, presence of rare, endangered or species of special concern.	IBI fair	IBI poor, very poor, or no fish.

EPT = Ephemeroptera, Plecoptera, Trichoptera, RA = Relative Abundance, TNI = Total Number of Individuals

Algae. Algal samples were collected from each biological monitoring station using both artificial substrates (for biomass estimates) and natural substrates (for algal identification and community structure evaluation). The condition of the algal community was determined by a diatom bioassessment index (DBI), which includes the following metrics: total number of diatom species, diversity, pollution tolerance index, and relative abundance of sensitive species. Relative abundance of non-diatom algae and biomass (chlorophyll *a* and ash-free dry-weight) were used to support the DBI, which classifies algal communities as excellent or good (supporting WAH uses), fair (partially supporting), or poor (not supporting).

Macroinvertebrates. Macroinvertebrates were collected using both artificial substrates and qualitative collections from all available natural substrate habitats. For the macroinvertebrate evaluations, stream reaches were considered to fully support the WAH use if information reflected no alterations in community structure or functional compositions for the available habitats, and if habitat conditions were relatively undisturbed. A reach was considered partially supporting uses when information revealed that community structure was slightly altered, that functional feeding components were noticeably influenced, or if available habitats reflected some alterations and/or reductions. Reaches were considered not supporting uses if information reflected sustained alterations or deletions in community structure, taxa richness and functional feeding types, or if available habitats were severely reduced or eliminated.

Fish. Fish were collected for community structure evaluation at biological monitoring sites where sampling could be conducted. The condition of the fish community was determined by analysis of species richness, relative abundance, species composition, and with the Index of Biotic Integrity (IBI). The IBI was used to assess biotic integrity directly by evaluation of 12 attributes, or metrics, of fish communities in streams. These community metrics include measurement of species richness and composition, trophic structure, and fish abundance and condition. The IBI was used to assign one of the following categories to a fish community: excellent, good, fair, poor, very poor, or no fish. Reaches with an IBI of excellent or good were considered to fully support uses. Reaches were assessed as partially supporting uses if they had an IBI of fair, while reaches were considered not supporting uses when the IBI category was poor, very poor, or no fish.

Intensive Survey Data

Six intensive surveys to determine use support were conducted in the 1992-1993 biennium. Data also were used from 50 additional surveys conducted between 1982 and 1991. The streams were assessed by evaluating principally the biological communities (refer to Table 1-8), and secondarily physicochemical, toxicity, and habitat data, as well as known watershed activities, direct observation, and professional judgement. To analyze biological data, the DOW uses a multicomponent (algae, macroinvertebrate, and fish communities) approach. At least two of the three components are used to assess water quality. Each component is analyzed using a variety or metrics that have proven sensitive to a wide variety of impacts. Stream mileages were grouped as supporting, supporting but threatened, partially supporting, or nonsupporting designated uses. Streams are considered to support designated uses if no or minor impacts to the biotic integrity, physical habitat, and water quality are observed. Supporting but threatened waters are those in which manmade activities occurring in the upstream drainage are extensive enough to degrade water quality if pollution abatement measures are not taken. Streams are determined to be partially supporting when the data indicate either stressed biotic communities, minor violations of water quality criteria, or some physical impairment to aquatic habitats. Nonsupporting streams are those showing severe stress, such as sustained species deletions, trophic imbalances in the biotic communities, chronic violations of water quality criteria, and severely impaired aquatic habitats.

Kentucky Department of Fish and Wildlife Resources Data

The DOW sent questionnaires to District Fisheries Biologists of the Kentucky Department of Fish and Wildlife Resources (KDFWR). The responses were classified as evaluated assessments. Lists of waterbodies in the fishery district were sent to the biologists. A questionnaire accompanied the waterbody listing. The biologists were requested to rate the waterbody fishery either good or poor. If poor, the biologist was asked to state the reason(s).

In this assessment of use support, only those questionnaire responses indicating definite support or nonsupport were used. A waterbody was considered to fully support WAH use if:

(1) the waterbody supported a good fishery based on presence of both young-of-year and adult sport fishes, or served as a nursery for a larger waterbody, and

(2) water quality was judged good, with no repeated history of fish kills.

A waterbody did not support the WAH use if:

(1) the waterbody fishery was poor, and

(2) water quality was judged poor, with a history of recurrent fish kills.

Another source of data for the evaluated category was a list of streams recommended by the KDFWR as candidates for Outstanding Resource Waters. They were recommended because of their outstanding value as sport fishing streams. These streams were assessed as fully supporting warmwater aquatic habitat use if there were no data which conflicted with the assessment.

Other Data Sources

The KDFWR conducts field surveys that identify streams capable of supporting a sustainable year-round trout fishery. These data allow the DOW to classify streams as Coldwater Aquatic Habitat (CAH). Streams classified as CAH were considered to fully support the CAH use and were considered as monitored waters in the assessment.

The Louisville and Jefferson County Metropolitan Sewer District, in cooperation with the USGS, has a monitoring program for streams in Jefferson County. Twenty-six stations are monitored for a variety of parameters including fecal coliform bacteria. Macroinvertebrate and fish collections are also made. The DOW used the chemical and bacteriological data from 1989 to 1991 for this report and considered it as monitored data in the assessments.

Field work conducted for the U.S. Fish and Wildlife Service identified streams in Kentucky that harbored the blackside dace, a federally threatened species of fish. This work was considered as monitored data. These streams are automatically classified as State Outstanding Resource Waters and were judged to fully support the WAH use.

Streams surveyed by the Kentucky State Nature Preserves Commission for a special project to obtain background aquatic biota and water quality data in the oil shale region of the state were utilized as monitored information in this report. The information was published in a 1984 report entitled <u>Aquatic Biota and Water Quality and Quantity Survey of the Kentucky Oil Shale Region</u>.

The Blaine Creek watershed has been monitored by the COE - Huntington District for several years in conjunction with the Yatesville Lake project. The COE macroinvertebrate and chemical data were utilized as monitored information for this report.

Fish Consumption Use Support

Fish consumption is a category that, in conjunction with aquatic life use, assesses attainment of the fishable goal of the Clean Water Act. Assessment of the fishable goal was separated into these two categories in 1992 because a fish consumption advisory does not necessarily preclude attainment of the aquatic life use, and vice versa. Separating fish consumption and aquatic life uses gives a clearer picture of actual water quality conditions.

The following criteria were used to assess support for the fish consumption use:

- o Fully Supporting: No fish advisories or bans in effect.

- o Partially Supporting: "Restricted consumption" fish advisory or ban in effect for general population or a subpopulation that could be at potentially greater risk (e.g., pregnant women, children). Restricted consumption is defined as limits on the number of meals consumed per unit time for one or more fish species.

- o Not Supporting: "No consumption" fish advisory or ban in effect for general population, or a subpopulation that could be at potentially greater risk, for one or more fish species; commercial fishing ban in effect.

Use Support Summary

Overall use support was assessed by following EPA guidelines that define fully supporting as fully supporting of all uses for which data are available. If a segment supported one use, but did not support another, it was listed as not supporting. For instance, if a segment supported a WAH use but not a primary contact recreation use, it was listed as not supporting. A segment is listed as partially supporting if any assessed use fell into that category even if another use was fully supported. Many waterbodies were assessed for only one use because data were not available to assess other uses.

Table 1-9 shows that of the 15,892 miles assessed, 72% fully supported uses, 18% did not support uses, and 10% partially supported uses. This summary includes ORSANCO's assessment of the mainstem of the Ohio River. ORSANCO reports that 127.5 miles of the Ohio River bordering Kentucky do not support uses because of violations of fecal coliform criteria. Some of these same miles also did not support the aquatic life use. The remaining 536.4 miles of the Ohio River partially supported the fish consumption use, sometimes in conjunction with partial support of contact recreation and aquatic life uses.

Of the miles assessed by the DOW in the other river basins, those fully supporting uses ranged from 45% in the Big Sandy basin to 100% in the Tygarts Creek basin. Five other basins (Green, Lower Cumberland, Tennessee, Mississippi, and Ohio River minor tributaries) had at least 80% of assessed miles fully supporting uses.

Table 1-9
Designated Use Support by River Basin

Basin	Miles Assessed	Miles Fully Supporting Uses	Miles Partially Supporting Uses	Miles Not Supporting Uses
Big Sandy	981.7	440.8	13.5	527.4
Little Sandy	323.4	229.0	71.1	23.3
Tygarts Creek	194.9	194.9	0.0	0.0
Licking	1836.7	1414.3	35.7	386.7
Kentucky	2956.3	2048.1	288.0	620.2
Upper Cumberland	1371.1	1061.4	171.4	138.3
Salt	1294.2	796.3	99.6	398.3
Green	3227.3	2693.4	111.6	422.3
Tradewater	431.7	244.4	96.2	91.1
Lower Cumberland	605.3	484.1	100.2	21.0
Tennessee	354.4	313.5	21.5	19.4
Mississippi Tribs	424.9	411.4	0.0	13.5
Ohio Minor Tribs.	1226.0	1083.9	47.9	94.2
Ohio Mainstem*	663.9	0.0	536.4	127.5
State Total	15,891.8	11,415.5	1593.1	2883.2

*Assessment provided in ORSANCO 1994 305(b) report.

Table 1-10 shows the summary results of evaluated and monitored use assessments from DOW data. The use support mileages are slightly different from those in Table 1-9 because they do not include ORSANCO's assessment of the mainstem of the Ohio River. Of the 15,228 miles assessed, 39% were based on monitored data and 61% on evaluated information. The use most impaired was swimming (Table 1-11), with 42% of waters assessed not supporting that use. In contrast, aquatic life use was fully supported in 84%, partially supported in 7%, and not supported in less than 10% of the assessed waters.

The threatened category refers to stream miles that were judged to be in danger of use impairment from anticipated land use changes or data trends indicating a decline in quality. The aquatic life use of four streams was judged to be threatened by siltation from silvicultural activities (Rockcastle River, Horselick Creek, Raccoon Creek, and White Oak Creek). The WAH use in Illwill Creek (Clinton County) is threatened by petroleum activities. Boone Creek in Fayette County is threatened by development in its headwaters at the interstate exchange. The South Fork of Russell Creek in Adair County is threatened by oil brine. The Little and Big South Forks Cumberland River (McCreary County) are threatened by acid mine drainage, and the wild river section of the Cumberland River is threatened by siltation from coal mining.

Table 1-10
Summary of Assessed* Use Support (miles)

	Assessment Basis		
Degree of Use Support	**Evaluated**	**Monitored**	**Total Assessed**
Miles Fully Supporting	8033.2	3234.4	11,267.6
Miles Fully Supporting but Threatened	0.0	147.9	147.9
Miles Partially Supporting	325.1	731.6	1056.7
Miles Not Supporting	991.8	1763.9	2755.7
TOTAL	9350.1	5877.8	15,227.9

*Excludes mainstems of Ohio and Mississippi rivers; refer to ORSANCO and Missouri 305(b) reports for assessments.

Table 1-11
Summary of Individual Use Support for Rivers and Streams (miles)

	Fish Consumption	Aquatic Life	Swimming
Supporting	14,811.6	12,377.4	2,178.3
Threatened	0.0	134.6	0.0
Partially Supporting	0.0	1,003.1	456.7
Not Supporting	124.9	1,421.4	1,929.4
TOTAL Assessed	14,936.5	14,936.5	4,564.4

Causes of Use Nonsupport

Table 1-12 indicates the relative causes of use nonsupport. Stream segment lengths that either did not support or partially supported uses were combined to indicate the miles that were affected. Fecal coliform bacteria (pathogen indicators) were the greatest cause of use impairment and affected swimming use in 2005 miles of streams and rivers. Siltation was the second greatest cause of use impairment, impairing aquatic life use in 1306 miles of streams and rivers and moderately impacting an additional 72 miles. Siltation affects the use by covering available habitat and reducing habitat for aquatic organisms. Organic enrichment was the third leading cause of use impairment. Organic enrichment lowers dissolved oxygen in streams, causing stress on aquatic life. Aquatic life use was impaired in 635 miles of streams because of organic enrichment effects.

Table 1-12
Causes of Use Nonsupport in Rivers and Streams

	Miles Affected	
Cause Category	**Major Impact**	**Moderate/Minor Impact**
Pathogen indicators	1835.1	169.9
Siltation	1305.8	72.0
Organic enrichment/D.O.	591.3	43.4
Nutrients	325.7	109.7
pH	411.9	0.0
Metals	255.9	34.8
Salinity/TDS/Chlorides	159.5	20.1
Turbidity	234.3	0.0
Priority organics	144.3	0.0
Unknown toxicity	65.3	0.0
Habitat alterations	99.1	43.3
Oil and grease	36.1	0.0
Suspended solids	95.4	0.0
Other	23.4	8.2

Sources of Use Nonsupport

Sources of use nonsupport were assessed under point and nonpoint categories and are listed in Table 1-13. Nonpoint sources as a whole affected about three times as many miles of streams as point sources. In some cases, both nonpoint and point sources contribute to use nonsupport in a particular surface water.

Resource extraction, municipal and package plant sanitary wastewater point sources, and agricultural nonpoint sources were the leading sources of use nonsupport, each affecting more than 1000 miles of streams. Siltation from coal mining and chlorides from petroleum sources impaired aquatic life uses. Fecal coaliform bacteria from sanitary wastewater point sources primarily affected swimming use. Nutrients from municipal sources also impaired aquatic life use. Agriculture affected aquatic life uses because of siltation and nutrients and primary contact recreation use because of fecal coliform contamination.

Table 1-13
Sources of Use Nonsupport in Rivers and Streams

Source Category	Miles Affected: Major Impact	Miles Affected: Moderate/Minor Impact
Point Sources		
Municipal/Package Plants	1458.0	70.8
Industrial	158.5	25.4
Combined sewer overflows	23.6	0.0
TOTAL	1640.1	96.2
Nonpoint Sources		
Resource extraction	1561.7	0.0
Agriculture	1027.4	1077.8
Land disposal/septic tanks	552.0	213.8
Urban Runoff/Storm sewers	567.4	90.5
Hydro-Habitat modification	81.7	68.6
Silviculture	43.1	77.0
Construction/Development	2.5	0.0
TOTAL	3835.8	1527.7
Unknown	289.2	85.1

Rivers and Streams Not Supporting Uses

Table 1-14 lists streams and rivers that did not support warmwater aquatic habitat (denoted as aquatic life) and swimming uses. Stream miles affected, type of assessment data (monitored or evaluated), and causes and sources of nonsupport are also listed. The table does not include streams and rivers in the partial support category. The waters in Table 1-14 are the most impaired rivers and streams in the state.

Table 1-14
List of Streams Not Supporting Uses by River Basin

Stream (Waterbody I.D.)		Uses Not Supported: Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
Big Sandy River Basin							
Tug Fork	(KY5070201-001) (KY5070201-004)	10.3(E)*	Siltation	Mining/ Silviculture	57.9(M,**E)	Pathogens	Package Plants/ Septic Tanks/ Agriculture
Road Fork	(KY5070201-002)	2.1(E)	Siltation	Mining			
Straight Fork Road	(KY5070201-002)	1.6(E)	Siltation	Mining			
Coldwater Fork	(KY5070201-002)	8.5(E)	Siltation/pH/ Metals/Suspended Solids/Chlorides	Mining/ Petroleum Activities	8.5(E)	pH	Mining
Wolf Creek	(KY5070201-003)	20.5(E)	Siltation/pH/ Metals/Turbidity	Mining	20.5(E)	pH	Mining
Meathouse Creek	(KY5070201-003)	4.3(E)	Siltation/pH/ Metals/Turbidity	Mining	4.3(E)	pH	Mining
Pigeon Roost Fork & Davis Fork	(KY5070201-003)	9.8(E)	Siltation/pH/ Metals/Turbidity	Mining	9.8(E)	pH	Mining
White Oak Fork	(KY5070201-003)	6.0(E)	Siltation/pH/ Metals/Turbidity	Mining	6.0(E)	pH	Mining
Peter Cave Fork	(KY5070201-003)	6.6(E)	Siltation/pH/ Metals/Turbidity	Mining	6.6(E)	pH	Mining
Emily Creek	(KY5070201-003)	7.0(E)	Siltation/pH Metals/Turbidity	Mining	7.0(E)	pH	Mining

Table 1-14 (Continued)
List of Streams Not Supporting Uses by River Basin

Stream	(Waterbody I.D.)	Uses Not Supported: Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
Big Sandy River Basin (Continued)							
Big Creek	(KY5070201-005)	19.7(E)	Siltation	Agriculture/ Mining			
Knox Creek	(KY5070201-010)				7.6(E)	Pathogens	Agriculture/Septic Tanks
Levisa Fork	(KY5070202-001) (KY5070203-001) (KY5070203-010) (KY5070203-016) (KY5070203-021)	10.5(E)	Siltation/ Turbidity	Mining	65.1(M)	Pathogens	Package Plants/ Septic Tanks Agriculture
Bull Creek	(KY5070203-017)	7.2(E)	Siltation/Habitat Alterations	Mining/ Streambank Modification			
Shelby Creek	(KY5070202-002)				10.0(E)	Pathogens	Package Plants
Greasy Creek	(KY5070202-003)	7.2(E)	Siltation	Mining			
Russell Fork	(KY5070202-004)				16.0(E)	Pathogens	Municipal/Package Plants/Septic Tanks/ Agriculture
Elkhorn Creek	(KY5070202-005)				27.4(E)	Pathogens	Package Plants
Paint Creek	(KY5070203-005)				1.0(E)	Pathogens	Urban Runoff/ Storm Sewers
Jennys Creek	(KY5070203-006)	11.0(E)	Siltation	Road Construction			

Table 1-14 (Continued)
List of Streams Not Supporting Uses by River Basin

Stream (Waterbody I.D.)		Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
		Uses Not Supported					
Big Sandy River Basin (Continued)							
Lick Fork	(KY5070203-006)	7.8(E)	Siltation	Road Construction			
Mudlick Creek	(KY5070203-007)	11.0(E)	Siltation	Mining			
Brushy Fork	(KY5070203-013)	18.5(E)	Siltation/ Turbidity	Mining			
Buffalo Creek	(KY5070203-013)	10.9(E)	Siltation/ Turbidity	Mining			
John Creek	(KY5070203-013)	44.7(E)	Siltation/ Turbidity	Mining			
Left Fork Brushy	(KY5070203-013)	8.0(E)	Siltation/ Turbidity	Mining			
Raccoon Creek	(KY5070203-013)	11.0(E)	Siltation/ Turbidity	Mining			
Middle Creek	(KY5070203-014)	18.0(E)	Siltation/pH	Mining	18.0(E)	pH	Mining
Left Fork Middle Creek	(KY5070203-014)	9.5(E)	Siltation/pH	Mining	9.5(E)	pH	Mining
Beaver Creek	(KY5070203-018)	7.0(E)	Siltation	Mining/ Streambank Modification	7.0(E)	Pathogens	Package Plants/ Municipal
Left Fork Beaver Creek	(KY5070203-020)	28.0(E)	Siltation	Mining			

Table 1-14 (Continued)
List of Streams Not Supporting Uses by River Basin

Stream	(Waterbody I.D.)	Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
		Uses Not Supported					
Big Sandy River Basin (Continued)							
Big Sandy	(KY5070204-001)				26.8(M)	Pathogens	Municipal/Package Plants/Septic Tanks/Agriculture
Little Sandy River Basin							
East Fork Little Sandy River	(KY5090104-003)	6.0(M)	Organic Enrichment	Package Plants			
Shope Creek	(KY5090104-003)	5.4(M)	Organic Enrichment	Package Plants			
Newcombe Creek	(KY5090104-009)	11.9(M)	Chlorides	Petroleum Activities			
Licking River Basin							
Licking River	(KY5100101-001) (KY5100101-004) (KY5100101-015) (KY5100101-034)	6.3(M)	Metals	Unknown	98.1(M)	Pathogens	Municipal/Package Plants/Septic Tanks/Agriculture/ Combined Sewer Overflows
North Fork Licking River	(KY5100101-012)				31.8(M)	Pathogens	Agriculture
Banklick Creek	(KY5100101-002)				19.0(M)	Pathogens	Combined Sewer Overflows
Three-Mile Creek	(KY5100101-003)				4.7(M)	Pathogens	Urban Runoff/ Storm Sewers

Table 1-14 (Continued)
List of Streams Not Supporting Uses by River Basin

Stream	(Waterbody I.D.)	Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
		Uses Not Supported					
Licking River Basin (Continued)							
Fleming Creek	(KY5100101-018)				16.5(M)	Pathogens	Agriculture/Pasture Land/Feedlots
Sleepy Run	(KY5100101-018)				3.0(M)	Pathogens	Pasture Land/Feedlots
Wilson Run	(KY5100101-018)				5.1(M)	Pathogens	Pasture Land/Feedlots
Town Branch	(KY5100101-018)				4.0(M)	Pathogens	Pasture Land/Feedlots
Allison Creek	(KY5100101-018)				4.7(M)	Pathogens	Pasture Land/Feedlots
Lick Creek	(KY5100101-037)	9.2(E)	Chlorides	Petroleum Activities			
Raccoon Creek	(KY5100101-037)	5.2(E)	Chlorides	Petroleum Activities			
Burning Fork	(KY5100101-038)	7.5(E)	Chlorides	Petroleum Activities			
State Road Fork	(KY5100101-038)	5.1(E)	Chlorides	Petroleum Activities			
Rockhouse Fork	(KY5100101-038)	5.0(E)	Chlorides	Petroleum Activities			

Table 1-14 (Continued)
List of Streams Not Supporting Uses by River Basin

Stream (Waterbody I.D.)		Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
		Uses Not Supported					
<u>Licking River Basin (Continued)</u>							
South Fk. Licking River	(KY5100102-001)				15.6(M)	Pathogens	Agriculture
Indian Creek	(KY5100102-009)				0.6(E)	Pathogens	Municipal
Stoner Creek	(KY5100102-012)				9.6(E)	Pathogens	Agriculture/Urban Runoff
Houston Creek	(KY5100102-013)				14.0(E)	Pathogens	Agriculture
Hancock Creek	(KY5100102-017)				7.6(E)	Pathogens	Package Plants/ Urban Runoff/Storm Sewers
Strodes Creek	(KY5100102-017)				26.5(E)	Pathogens	Agriculture/Package Plants/Urban Runoff/Storm Sewers
Hinkston Creek	(KY5100102-024)				19.8(E)	Pathogens	Municipal/Package Plants/Agriculture
<u>Kentucky River Basin</u>							
North Fork Kentucky River	(KY5100201-010) (KY5100201-012) (KY5100201-017) (KY5100201-022)	108.2(E)	Siltation	Mining	86.4(M)	Pathogens	Municipal/Package Plants/Septic Tanks

Table 1-14 (Continued)
List of Streams Not Supporting Uses by River Basin

		Uses Not Supported					
Stream	(Waterbody I.D.)	Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
Kentucky River Basin (Continued)							
Cane Creek	(KY5100201-006)				9.5(M)	Pathogens	Agriculture/Septic Tanks
Spring Fork Quicksand Creek	(KY5100201-007)	15.0(E)	Siltation	Mining			
Lost Creek	(KY5100201-009)	18.5(E)	Siltation	Mining			
Troublesome Creek	(KY5100201-009)				49.5(M)	Pathogens	Package Plants/ Municipal/Septic Tanks/Urban Runoff/Storm Sewers
Grapevine Creek	(KY5100201-011)	8.5(E)	Siltation	Mining			
Big Creek	(KY5100201-011)	9.6(E)	Siltation	Mining			
Carr Fork	(KY5100201-014)				8.7(M)	Pathogens	Septic Tanks
Leatherwood Creek	(KY5100201-018)	13.9(E)	Siltation/pH/ Metals/Suspended Solids	Mining	13.9(E)	pH	Mining
Little Leatherwood Ck	(KY5100201-018)	6.6(E)	Siltation/pH/ Metals/Suspended Solids	Mining	6.6(E)	pH	Mining
Turkey Creek	(KY5100201-019)	6.4(E)	Siltation	Mining			

Table 1-14 (Continued)
List of Streams Not Supporting Uses by River Basin

Stream (Waterbody I.D.)		Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
		Uses Not Supported					
Kentucky River Basin (Continued)							
Maces Creek	(KY5100201-020)	6.8(E)	Siltation	Mining			
Bull Creek	(KY5100201-020)	5.3(E)	Siltation	Mining			
Stratton Fork	(KY5100201-020)	7.0(E)	Siltation	Mining			
Rockhouse Creek	(KY5100201-021)	24.3(E)	Siltation	Mining			
Kings Creek	(KY5100201-022)	6.5(E)	Siltation	Mining			
Smoot Creek	(KY5100201-022)	7.4(E)	Siltation	Mining			
Boone Fork	(KY5100201-022)	3.3(E)	Siltation	Mining			
Yonts Creek	(KY5100201-022)	3.4(E)	Siltation	Mining			
Wright Fork	(KY5100201-022)	4.7(E)	Siltation	Mining			
Middle Fork Kentucky River	(KY5100202-004) (KY5100202-007)	27.1(E)	Siltation	Mining			
Cutshin Creek	(KY5100202-006)	28.8(E)	Oil and Grease/ Siltation	Petroleum Activities/Mining			
Raccoon Creek	(KY5100202-006)	7.3(E)	Oil and Grease/ Siltation	Petroleum Activities/Mining			
Billey Fork	(KY5100204-009)	8.1(M)	Chlorides	Petroleum Activities			

Table 1-14 (Continued)
List of Streams Not Supporting Uses by River Basin

Stream (Waterbody I.D.)		Uses Not Supported Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
Kentucky River Basin (Continued)							
Millers Creek	(KY5100204-009)	6.4(M)	Chlorides	Petroleum Activities/ Silviculture			
Big Sinking Creek	(KY5100204-009)	14.1(M)	Chlorides	Petroleum Activities			
Bald Rock Fork	(KY5100204-009)	1.7(E)	Chlorides	Petroleum Activities			
Right Fork Zachariah	(KY5100204-009)	1.3(E)	Chlorides	Petroleum Activities			
Left Fork Zachariah	(KY5100204-009)	1.3(E)	Chlorides	Petroleum Activities			
Red River	(KY5100204-013)				31.6(M)	Pathogens	Municipal/Septic Tanks/Urban Runoff/Storm Sewers/Agriculture
Cat Creek	(KY5100204-017)	7.7(M)	Organic Enrichment/ Metals	Source Unknown			
South Fork Red River	(KY5100204-018)	10.1(M)	Chlorides	Petroleum Activities			
Sand Lick Creek	(KY5100204-018)	5.0 (M)	Chlorides	Petroleum Activities			

Table 1-14 (Continued)
List of Streams Not Supporting Uses by River Basin

Stream	(Waterbody I.D.)	Uses Not Supported: Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
<u>Kentucky River Basin (Continued)</u>							
Eagle Creek	(KY5100205-003) (KY5100205-005)				38.8(M)	Pathogens	Agriculture
Elkhorn Creek	(KY5100205-018)				17.8(M)	Pathogens	Source Unknown
Dry Run	(KY5100205-023)				7.5(E)	Pathogens	Agriculture/Urban Runoff/Storm Sewers
U.T. to North Elkhorn Creek	(KY5100205-025)				10.8(E)	Pathogens	Agriculture
South Elkhorn Creek	(KY5100205-026)				17.6(M)	Pathogens	Urban Runoff/ Storm Sewers/ Agriculture
Lee Branch	(KY5100205-027)	1.0(E)	Organic Enrichment	Municipal			
Town Branch of S. Elkhorn Creek	(KY5100205-028)	11.3(M)	Organic Enrichment/ Nutrients	Municipal/Urban Runoff/Storm Sewers			
Clarks Run	(KY5100205-039)	8.0(E)	pH/Organic Enrichment	Municipal/Urban Runoff/Storm Sewers	8.0(E)	pH	Municipal/Urban Runoff/Storm Sewers
Baughman Fork	(KY5100205-054)	1.1(M)	Organic Enrichment/ Nutrients	Package Plants			

Table 1-14 (Continued)
List of Streams Not Supporting Uses by River Basin

Stream (Waterbody I.D.)		Uses Not Supported: Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
Green River Basin							
Valley Creek	(KY5110001-012)	17.5(M)	Organic Enrichment/ Chlorine	Municipal/ Urban Runoff/ Storm Sewers			
Green River	(KY5110001-018)				66.7(M)	Pathogens	Pasture Land/Feed Lots/Animal Holding/Mgt. Areas
Patoka Creek	(KY5110002-018)				4.3(E)	Pathogens	Pasture Land/ Feedlots/ Animal Holding/ Mgt. Areas
Lewis Creek	(KY5110003-002)	14.9(E)	pH	Acid Mine Drainage	14.9(E)	pH	Acid Mine Drainage
Pond Creek	(KY5110003-003)	23.8(E)	pH/Metals	Mining	23.8(E)	pH/Metals	Mining
Bat East Creek	(KY5110003-003)	7.3(E)	pH/Metals	Acid Mine Drainage	7.3(E)	pH	Acid Mine Drainage
Caney Fork	(KY5110003-003)	7.1(E)	pH/Metals	Acid Mine Drainage	7.1(E)	pH	Acid Mine Drainage
Sandlick Creek	(KY5110003-003)	4.0(E)	pH/Metals	Acid Mine Drainage	4.0(E)	pH	Acid Mine Drainage

Table 1-14 (Continued)
List of Streams Not Supporting Uses by River Basin

Stream (Waterbody I.D.)		Uses Not Supported: Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
Green River Basin (Continued)							
Mud River	(KY5110003-005) (KY5110003-008)	64.8(M)	Priority Organics/ Organic Enrichment	Industrial/ Unknown			
Green River	(KY5110005-001) (KY5110005-003) (KY5110005-011)				55.1(M)	Pathogens	Agriculture/ Urban Runoff/ Storm Sewers
North Fk. Panther Creek	(KY5110005-009)	12.7(E)	Flow Alteration/ Habitat Alteration	Channelization			
South Fk. Panther Creek	(KY5110005-010)	9.9(E)	Flow Alteration/ Habitat Alteration	Channelization			
Buck Creek	(KY5110005-016)	11.0(E)	Ammonia/pH/ Organic Enrichment	Industrial/Mining/ Animal Holding/ Mgt. Areas	11.0(E)	pH	Mining
West Fk. Buck Creek	(KY5110005-016)	3.9(E)	Ammonia/pH/ Organic Enrichment	Industrial/Mining Animal Holding/ Mgt. Areas	3.9(E)	pH	Mining
Cypress Creek	(KY5110006-002)	8.3(E)	pH	Mining	8.3(E)	pH	Mining
Harris Branch	(KY5110006-002)	2.6(E)	pH	Mining	2.6(E)	pH	Mining
Flat Creek	(KY5110006-005)	10.6(E)	pH	Mining	10.6(E)	pH	Mining
UT to Flat Creek	(KY5110006-005)	5.0(E)	pH	Mining	5.0(E)	pH	Mining
Drakes Creek	(KY5110006-006)	8.5(E)	pH	Mining	21.3(E)	pH	Mining

Table 1-14 (Continued)
List of Streams Not Supporting Uses by River Basin

Stream (Waterbody I.D.)		Uses Not Supported: Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
Upper Cumberland River Basin							
Buck Creek	(KY5130101-016)	0.2(M)	Siltation/Flow Alteration/ Habitat Alteration	Mining			
Cumberland River	(KY5130101-025) (KY5130101-032)				16.2(M)	Pathogens	Municipal/Package Plants/Septic Tanks
Straight Creek	(KY5130101-030)	0.2(M)	Siltation/Flow Alteration/Mining/ Habitat Alteration		24.4(M)	Pathogens	Septic Tanks/Unknown
Left Fork Straight Creek	(KY5130101-030)				13.0(M)	Pathogens	Septic Tanks/Unknown
Poor Fork	(KY5130101-036)				49.7(M)	Pathogens	Municipal/Package Plants/Septic Tanks
Cloverlick Creek	(KY5130101-036)				8.1(M)	Pathogens	Septic Tanks
Looney Creek	(KY5130101-036)				8.9(M)	Pathogens	Municipal/Septic Tanks/Package Plants
Clover Fork	(KY5130101-037)				34.5(M)	Pathogens	Municipal/Septic Tanks/Package Plants
Martins Fork	(KY5130101-038)	8.0(E)	pH	Mining	4.4(M) 8.0(E)	Pathogens pH	Septic Tanks Mining

Table 1-14 (Continued)
List of Streams Not Supporting Uses by River Basin

Stream (Waterbody I.D.)		Uses Not Supported: Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
Upper Cumberland River Basin (Continued)							
Cranks Creek	(KY5130101-038)	15.1(M)	Siltation/pH	Mining	15.1(M)	pH	Mining
Big Lily Creek	(KY5130103-011)	2.6(M)	Chlorides/ Organic Enrichment	Municipal/Urban Runoff/Storm Sewers			
Elk Spring Creek	(KY5130103-018)	1.5(E)	Organic Enrichment	Municipal			
Rock Creek	(KY5130104-007)	4.0(M)	Metals/pH	Mining	4.0(M)	pH	Mining
Roaring Paunch Creek	(KY5130104-008)	15.6(M)	pH	Subsurface Mining/Surface Mining	15.6(M)	pH	Mining
Bear Creek	(KY5130104-009)	3.2(M)	pH	Subsurface Mining/Surface Mining	3.2(M)	pH	Surface Mining/ Subsurface Mining
Lower Cumberland River Basin							
North Fork Little River	(KY5130205-009)				14.0(E)	Pathogens	Urban Runoff/Storm Sewers/Agriculture
Elk Fork	(KY5130206-002)	7.0(E)	Organic Enrichment	Municipal/ Agriculture			

Table 1-14 (Continued)
List of Streams Not Supporting Uses by River Basin

		Uses Not Supported					
Stream (Waterbody I.D.)		**Aquatic Life (miles)**	**Cause**	**Source**	**Swimming (miles)**	**Cause**	**Source**
<u>Salt River Basin</u>							
Pond Creek	(KY5140102-002)	17.0(M)	Organic Enrichment/ Metals	Package Plants/ Urban Runoff/ Storm Sewers/ Unknown	17.0(M)	Pathogens	Package Plants/ Septic Tanks/Urban Runoff/Storm Sewers
Northern Ditch Pond Creek (inc. Fern Creek)	(KY5140102-002)	10.1(M)	Organic Enrichment/ Metals	Package Plants/ Urban Runoff/ Storm Sewers/ Septic Tanks	10.1(M)	Pathogens	Package Plants/ Urban Runoff/Storm Sewers/Septic Tanks
Southern Ditch Pond Creek	(KY5140102-002)	7.1(M)	Organic Enrichment/ Metals	Package Plants/ Urban Runoff/ Storm Sewers/ Septic Tanks	7.1(M)	Pathogens	Package Plants/ Urban Runoff/ Storm Sewers/ Septic Tanks
Spring Ditch Pond Creek	(KY5140102-002)	2.0(M)	Organic Enrichment/ Metals	Package Plants/ Urban Runoff/ Storm Sewers	2.0(M)	Pathogens	Package Plants/ Urban Runoff/ Storm Sewers
Fishpool Creek	(KY5140102-002)	5.4(M)	Organic Enrichment/ Metals	Package Plants/ Urban Runoff/ Storm Sewers/ Septic Tanks	5.4(M)	Pathogens	Package Plants/ Urban Runoff/ Storm Sewers/ Septic Tanks

Table 1-14 (Continued)
List of Streams Not Supporting Uses by River Basin

		Uses Not Supported					
Stream	(Waterbody I.D.)	Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
<u>Salt River Basin (Continued)</u>							
Knob Creek	(KY5140102-002)	15.3(E)	Organic Enrichment/ Metals	Urban Runoff/ Storm Sewers/ Package Plants/ Septic Tanks			
Briar Creek	(KY5140102-002)	5.7(E)	Organic Enrichment/ Metals	Urban Runoff/ Storm Sewers/ Package Plants/ Septic Tanks			
Mill Creek	(KY5140102-003)				13.5(E)	Pathogens	Municipal
Salt River	(KY5140102-005) (KY5140102-031) (KY5140102-033)				47.0(M)	Pathogens	Agriculture/ Septic Tanks/ Urban Runoff/ Storm Sewers/ Package Plants
Floyds Fork	(KY5140102-007) (KY5140102-011) (KY5140102-014)	13.0(E)	Organic Enrichment Metals	Package Plants/ Urban Runoff/ Storm Sewers/ Septic Tanks	23.8(M) 13.8(E)	Pathogens	Package Plants/ Urban Runoff/ Storm Sewers/ Septic Tanks/ Agriculture

Table 1-14 (Continued)
List of Streams Not Supporting Uses by River Basin

Stream (Waterbody I.D.)		Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
		Uses Not Supported					
<u>Salt River Basin (Continued)</u>							
Pennsylvania Run	(KY5140102-008)				3.0(M)	Pathogens	Package Plants/ Urban Runoff/ Storm Sewers/ Septic Tanks
Brooks Run	(KY5140102-009)	6.0(E)	Organic Enrichment	Package Plants/ Urban Runoff/ Storm Sewers	6.0(E)	Pathogens	Package Plants/ Urban Runoff/ Storm Sewers
Chenoweth Run	(KY5140102-010)	9.1(M)	Organic Enrichment/ Metals/ Nutrients	Domestic/ Urban Runoff/ Storm Sewers/	9.1(M)	Pathogens	Urban Runoff/ Storm Sewers/ Package Plants
Pope Lick Creek	(KY5140102-012)	5.0(M)	Organic Enrichment/ Unknown Toxicity	Package Plants/ Urban Runoff/ Storm Sewers/ Septic Tanks	5.0(M)	Pathogens	Package Plants/ Urban Runoff/ Storm Sewers/ Septic Tanks
Long Run	(KY5140102-012)				9.5(M)	Pathogens	Agriculture/ Septic Tanks

Table 1-14 (Continued)
List of Streams Not Supporting Uses by River Basin

Stream (Waterbody I.D.)		Uses Not Supported: Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
Salt River Basin (Continued)							
Beech Creek	(KY5140102-026)				30.1(M)	Pathogens	Pasture Lands/ Feedlots/ Manure Lagoons/ Animal Holding/ Mgt. Areas/ Septic Tanks
Crooked Creek	(KY5140102-027)				13.9(M)	Pathogens	Unknown
Ashes Creek	(KY5140102-028)				10.3(M)	Pathogens	Pasture Land/ Feedlots/ Animal Holding/ Mgt. Areas
Jacks Creek	(KY5140102-028)				8.0(M)	Pathogens	Pasture Land/ Feedlots/ Manure Lagoons/ Animals Holding/ Mgt. Areas

Table 1-14 (Continued)
List of Streams Not Supporting Uses by River Basin

		Uses Not Supported					
Stream	(Waterbody I.D.)	Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
Salt River Basin (Continued)							
Timber Creek	(KY5140102-028)				4.8(M)	Pathogens	Pasture Land/ Feedlots/ Manure Lagoons/ Animals Holding/ Mgt. Areas
Town Creek	(KY5140102-033)				3.2(M)	Pathogens	Pasture Lands/ Feedlots/Animal Holding/Mgt. Areas
Rolling Fork	(KY5140103-001) (KY5140103-005)				108.0(M)	Pathogens	Municipal/ Agriculture/Urban Runoff/Storm/ Sewers
Beech Fork	(KY5140103-012)				10.2(M)	Pathogens	Agriculture
Tradewater River Basin							
Crab Orchard Creek	(KY5140205-003)	22.6(E)	pH/Siltation	Mining/ Agriculture	22.6(E)	pH	Mining
Vaughn Ditch	(KY5140205-003)	3.2(E)	pH/Siltation	Mining/ Agriculture	3.2(E)	pH	Mining
Clear Creek	(KY5140205-008)	28.1(E)	pH/Siltation	Mining/ Agriculture	28.1(E)	pH	Mining

Table 1-14 (Continued)
List of Streams Not Supporting Uses by River Basin

		Uses Not Supported					
Stream	(Waterbody I.D.)	Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
Tradewater River Basin (Continued)							
Lick Creek	(KY5140205-008)	18.1(E)	pH/Siltation	Mining/ Agriculture	18.1(E)	pH	Mining
Caney Creek	(KY5140205-015)	11.3(E)	pH/Siltation	Mining/ Agriculture	11.3(E)	pH	Mining
Buffalo Creek	(KY5140205-016)	7.8(E)	pH/Siltation	Mining/ Agriculture	7.8(E)	pH	Mining
Tennessee River Basin							
Cypress Creek	(KY6040006-013)	19.4(E)	Unknown Toxicity/ Priority Organics	Industrial			
Ohio River Tributaries							
Elijah's Creek	(KY5090203-004)	5.2(M)	Nonpriority Organics	Industrial			
Big Run	(KY5140101-001)	5.3(E)	Organic Enrichment	Urban Runoff/ Storm Sewers			
UT to Mill Creek	(KY5140101-001)	2.5(E)	Organic Enrichment	Urban Runoff/ Storm Sewers			
Mill Creek	(KY5140101-001)	16.5(M)	Metals	Urban Runoff/ Storm Sewers/ Septic Tanks	16.5(M)	Pathogens	Urban Runoff/ Package Plants/ Storm Sewers/ Septic Tanks

Table 1-14 (Continued)
List of Streams Not Supporting Uses by River Basin

		Uses Not Supported					
Stream	(Waterbody I.D.)	Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
<u>Ohio River Tributaries (Continued)</u>							
Beargrass Creek	(KY5140101-002)	1.6(E)	Organic Enrichment/Metals	Urban Runoff/ Storm Sewers/ Combined Sewer Overflows/ Package Plants/ Septic Tanks			
Muddy Fork Beargrass Creek	(KY5140101-002)	6.9(M)	Organic Enrichment/Metals	Urban Runoff/ Storm Sewers/ Package Plants/ Septic Tanks			
South Fork Beargrass Creek	(KY5140101-002)	14.6(M)	Organic Enrichment/Metals	Urban Runoff/ Storm Sewers/ Combined Sewer Overflows	6.0(M)	Pathogens	Combined Sewer Overflows/Urban Runoff/Storm Sewers
Middle Fork Beargrass Creek	(KY5140101-002)	15.2(M)	Organic Enrichment/Metals	Urban Runoff/ Storm Sewers/ Package Plants/ Septic Tanks/ Combined Sewer Overflows	15.2(M)	Pathogens	Package Plants Septic Tanks/ Urban Runoff/ Storm Sewers/ Combined Sewer Overflows
Goose Creek	(KY5140101-003)	4.5(M)	Organic Enrichment/Metals	Package Plants/ Urban Runoff/ Storm Sewers/ Septic Tanks	7.2(M)	Pathogens	Package Plants/ Urban Runoff/ Storm Sewers/ Septic Tanks

Table 1-14 (Continued)
List of Streams Not Supporting Uses by River Basin

Stream (Waterbody I.D.)		Aquatic Life (miles)	Cause	Source	Swimming (miles)	Cause	Source
		Uses Not Supported					
<u>Ohio River Tributaries (Continued)</u>							
Little Goose Creek	(KY5140101-003)				8.7(M)	Pathogens	Package Plants/ Urban Runoff/ Storm Sewers/ Septic Tanks
Harrods Creek	(KY5140101-004)	4.0(M)	Organic Enrichment/Metals	Package Plants/ Urban Runoff/ Storm Sewers Septic Tanks	4.0(M)	Pathogens	Package Plants/ Urban Runoff/ Storm Sewers/ Septic Tanks
Little Bayou Creek	(KY5140206-002)	6.5(M)	Priority Organics	Hazardous Waste			

*E = evaluated
**M = monitored

Changes in Use Support: 1992 to 1994

Several waterbodies showed an improvement or a decline in water quality and a change in use support status since the 1992 report. All but one of the changes were in the swimming use category (Table 1-15). The changes in swimming use support are probably most related to differing rainfall patterns between the years as fecal coliform contamination has been positively linked to rain events. However, the improvement of water quality in the North Fork Kentucky River was a result of an effort by the DOW to improve treatment of sanitary wastewater point source discharges (described in greater detail later in this chapter). The Big Sandy River changed use support status for aquatic life because copper violated criteria in the previous reporting period, but did not for the current reporting period. Biological data were not used in either assessment at this station.

Table 1-15
Changes in Use Support at Ambient Monitoring Stations
1992 to 1994

	Non-or Partial Support to Full Support		Full or Partial Support to Nonsupport	
Waterbody	**Aquatic Life**	**Swimming**	**Aquatic Life**	**Swimming**
Big Sandy River near Louisa	X			
Licking River near Claysville				X
North Fork Kentucky River at Jackson		X		
Cumberland River near Pineville				X
Beech Fork near Maud				X
Green River near Munfordville				X
Bacon Creek		X		
Pond River near Sacremento		X		

Trends in Water Quality

An assessment of water quality trends can be used to help answer the following questions about the quality of streams and rivers.

1. Is water quality getting better, worse, or remaining the same?

2. Are efforts on the whole leading to improvements in water quality?

3. Are there increasing levels of human activities that are resulting in deteriorating conditions in a waterbody?

The Seasonal Kendall Test Without Correction for Correlation (SKWOC) was used in this report to assess water quality trends. The SKWOC was introduced for detection of monotonic trends and has become the standard for water quality trend analysis. A monotonic trend is a gradual change taking place over many years and with no reversal of direction. Researchers have recommended the SKWOC for use with monthly data records (less than 10 years in duration) when there is no serial correlation and there are 50 percent or fewer missing values. A seasonal version of Sen's nonparametric method was used to estimate the magnitude of the trend slope. These nonparametric (distribution-free) statistical tests are most appropriate for many water quality variables which do not follow a normal (bell-shaped) statistical distribution curve.

In a statistical evaluation of data, a trend of some magnitude will almost always be measured, but the trend may not be statistically significant. Statistics are used to determine the probability or chance that the trend is real and is not merely due to random variations in the data. For this report, a 95 percent confidence level (which corresponds to a 5 percent maximum probability of error) is used to conclude that a significant trend exists.

Trend analysis was accomplished by means of the WQHydro software developed by Eric Aroner of WQHydro, Inc. Protocol generally followed that presented in the Oregon 1990 305(b) report. Data for trend analysis were first downloaded from STORET. The data were then reviewed for acceptance into the trend analysis. Variables with less than 25 percent of values reported as not detected (ND) were considered acceptable for analysis. The SKWOC was performed on the raw data. If there was a significant trend in streamflow, a procedure was followed for adjusting concentration values for flow to remove the influence of varying discharge over time. The procedure creates flow-adjusted concentrations (FAC) for trend analysis. Trend analyses of FAC involved three steps. First, Kendall TAU, SPEARMAN RHO, and NORMAL SCORES PP-M correlations were run to check if the variable and flow were significantly correlated. If there was significant correlation, regression equations that could fit the relationship were performed. The regression with the lowest standard error (SE), and significance at the 95 percent probability level was chosen for FAC development. A plot of the selected regression model was prepared and viewed to insure that the fitted regression adequately represented the data. FACs were then calculated. FACs are the residuals from the regression relationship. The residuals are defined by the measured concentration minus the predicted concentration for the particular flow taken with the sample. The predicted value is obtained from the regression of the concentration on the appropriate function of discharge. Trend analyses were then performed on the FAC. Results of the trend analyses are presented in Appendix A.

The trend analysis protocol described above was applied to 31 fixed ambient monitoring stations maintained by the DOW. These stations have a continuous data record length of at least five years ending in September 1992.

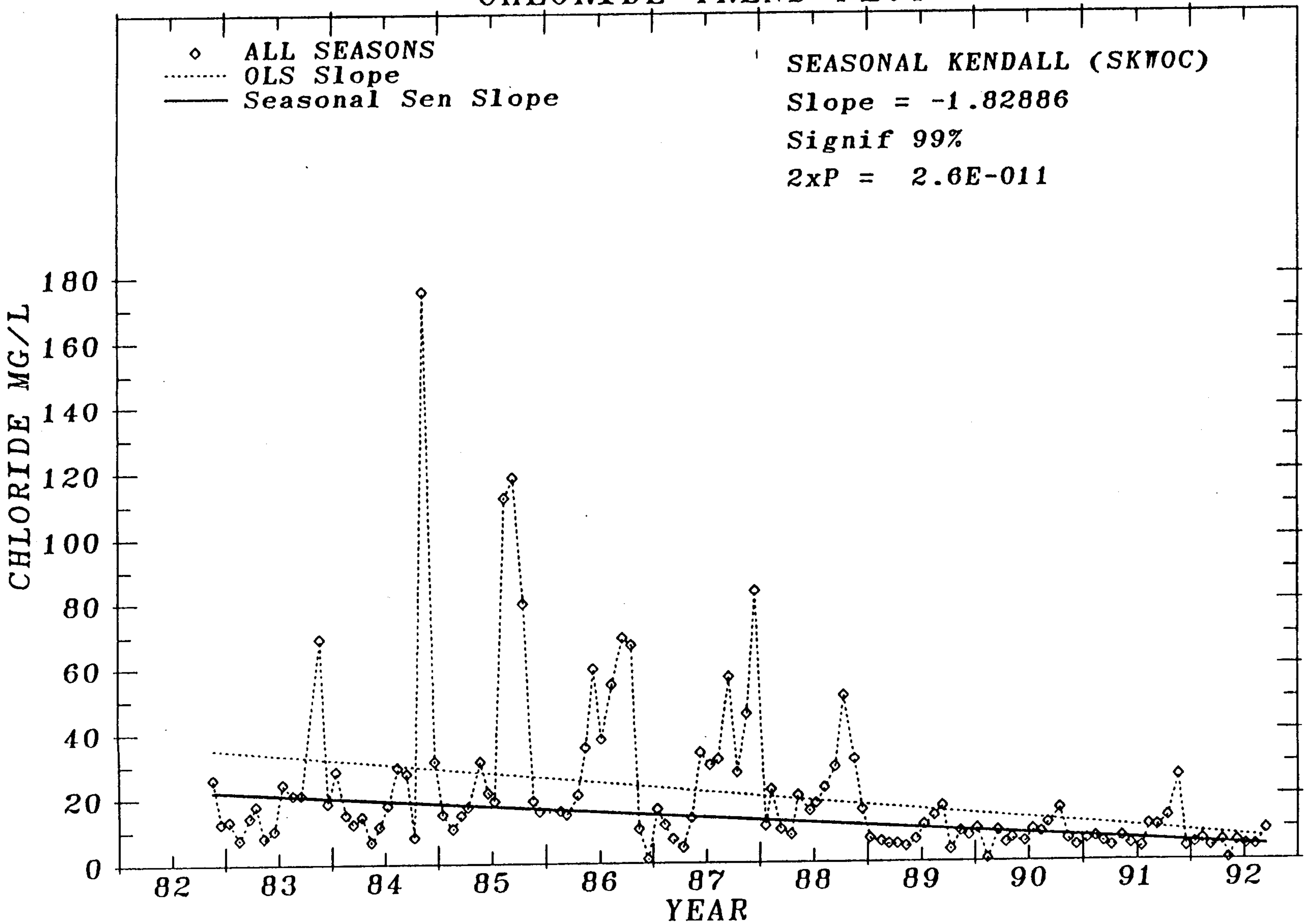
Five variable trends stand out. Chloride decreased significantly at 19 stations and increased significantly at only two stations. In general, nutrients (nitrite+nitrate-nitrogen and total phosphorous) exhibited decreasing trends statewide. Thirteen stations exhibited significant decreases of nitrite-nitrate nitrogen, while four stations showed significant increases. Total phosphorous decreased significantly at 18 stations. Ammonia-nitrogen, accepted at only four stations for trend analysis (not detected in greater than 25% of samples), decreased significantly at three stations and was not significant at the remaining station. Total recoverable iron exhibited increasing trends at 19 stations. Possible causes for these trends will not be addressed in this report, but will be addressed in future basin reports.

In the 1992 305(b) report, decreased chloride concentrations were noted in the Kentucky River at Heidelberg and Licking River at Salyersville. The decrease in chloride concentrations was attributed to enforcement of chloride limits on permits, decreases in oil production, and flow variations in the receiving steams. Trend analysis of chlorides in the Kentucky River at Camp Nelson and Frankfort, downstream of the area of oil production, reveal a significant improvement in water quality. Figure 1-2 illustrates the trend plot for chloride in the Kentucky River at Camp Nelson. Beginning in 1989, high chloride levels in the Kentucky River have decreased to near background levels.

Public Health/Aquatic Life Impacts: Toxics

Although the biological monitoring program focuses on the protection of aquatic life from toxics and conventional pollutants, an underlying theme of aquatic life protection is subsequent public health protection. The DOW has played an increasing role in public health protection through assessing the need for fish consumption advisories based on the concentrations of contaminants in fish tissue samples.

FIGURE 1-2 KENTUCKY RIVER AT CAMP NELSON
CHLORIDE TREND PLOT



Fish Consumption Advisories

Six individual fish consumption advisories are currently in effect within the Commonwealth of Kentucky (Table 1-16). Four advisories were discussed in the 1992 305(b) report and are still in place. Two new advisories (discussed below) were issued in late 1993 and early 1994 based on data collected the last two years. The advisories are based on contaminant residues exceeding the U.S. Food and Drug Administration (FDA) action levels in edible portions (fillets). PCB's are the contaminant of concern in five of the six advisories, chlordane is also of concern in the Ohio River advisory, and mercury is responsible for the sixth advisory. All advisories were jointly agreed upon and issued by the Kentucky Natural Resources and Environmental Protection Cabinet (NREPC), the Kentucky Department of Fish and Wildlife Resources (KDFWR), and the Cabinet for Human Resources. Operational protocols established in 1990 outline the roles of each agency in issuing fish consumption advisories. Additionally, ORSANCO and the states bordering the Ohio River coordinate the Ohio River advisory. In addition to the six advisories discussed above, Missouri has maintained an advisory on the 71 miles of the Mississippi River bordering Kentucky because of chlordane in fish tissue.

West Kentucky Wildlife Management Area (WKWMA). In November 1993, a fish consumption advisory for largemouth bass from five ponds on the WKWMA in McCracken County was issued because of mercury contamination. The advisory was a result of a cooperative sampling efforts of the Kentucky Department of Fish and Wildlife Resource and the U.S. Department of Energy. When high mercury levels were found in some fish, an intensive effort was made to sample all ponds and several species of fish (bluegill, channel catfish, and bass). The five ponds posted are: Fire Hydrant, Horse Shoe, New Pond, Box Factory and Gravel Pit No. 1. As no source of mercury contamination has been determined, the investigation is continuing.

Green River Lake. Based on data collected during 1992 and 1993, a consumption advisory for carp and channel catfish was issued in February 1994. Although the contamination is apparently confined to one small cove, the entire lake was included, since fish can move from the cove to other areas of the lake. Three rounds of sampling have confirmed that carp and channel catfish from the cove area have levels of PCBs above the FDA action level. The PCB levels in muskellunge, crappie, and largemouth bass were all well below the action level.

Table 1-16
Fish Consumption Advisory Summary

Stream	Pollutants	Source	Miles Covered	Date Established	Comments
Town Branch/Mud River (Logan, Butler and Muhlenberg counties)	PCBs	Dye-casting plant	71.5	October 1985	Cleanup in progress; monitoring continues. All species covered.
West Fork Drakes Creek (Simpson and Warren counties)	PCBs	Adhesive plant	46.9	April 1985	Monitoring continues; levels in fish appear to be declining. All species covered.
Little Bayou Creek (McCracken County)	PCBs	Gaseous diffusion plant	6.5	April 1989	On-site clean-up in progress; monitoring continues; contamination appears limited to Little Bayou Creek. All species covered.
Ohio River (entire length of Kentucky border)	PCBs Chlordane	Urban runoff; no known point source discharge	663.9	June 1989	Channel catfish, carp, white bass, paddlefish. Monitoring continues. Advisory re-issued 1992.
West Kentucky Wildlife Management Area (McCracken County)	Mercury	Unknown	5 Ponds	Nov. 1993	Largemouth Bass
Green River Lake (Taylor and Adair counties)	PCBs	Gas Pipeline Compressor Station	Entire Lake	Feb. 1994	Carp and channel catfish

The source of contamination is a natural gas pipeline compressor station located approximately 400 meters above the cove. Extensive testing has been conducted since the contamination was discovered in 1988. Cleanup of the site has begun, and data on fish tissue will continue to be collected to document the extent of the problem.

Public Health/Aquatic Life Impacts: Conventional Pollutants

Chlorine, un-ionized ammonia, oxygen demanding substances, and pathogenic organisms such as bacteria and viruses are classed as conventional pollutants. These pollutants are a cause of concern because they are often responsible for fish kills or, like bacteria and viruses, can pose a threat to human health. Reports on fish kills, bacteriological evaluations of water quality, and beach closures are discussed below.

Fish Kill Incidents

Twenty-one fish kill reports were received by KDFWR between January 1, 1992 and December 31, 1993. These kills involved 38.76 miles of stream on 23 different waterbodies. Oil and chemical spills were the most common identified cause of fish kills. Three fish kills were caused by unknown sources. Table 1-17 summarizes the severity, causes, and locations of fish kills during the reporting period. Appendix B gives a more detailed list of the fish kills that were investigated. A synopsis of fish kill records from 1980-1993 is shown in Table 1-18.

Bacteriological Evaluations of Swimming Use

Fecal coliform bacteria are measured in water samples as indicators of the potential presence of other disease-causing bacteria. The most common illnesses experienced from swimming in waters contaminated by fecal coliform bacteria are gastroenteritis, ear infections, and skin infections (swimmers itch). Bacteriological surveys were conducted during the 1992-1993 recreation seasons in the areas listed below:

- North Fork Kentucky River
- Upper Cumberland River Basin
- Three-mile Creek/Lower Licking River/Banklick Creek
- Embayment/Dock Areas at Lake Cumberland and Laurel River Lake
- Fleming Creek
- Fishtrap, Paintsville, and Dewey Lakes

A swimming advisory was issued in July 1990 for the entire length (162.6 miles) of the North Fork Kentucky River. Ten mainstem monitoring stations were used to monitor fecal coliform levels. As a result of compliance sampling inspections, fines totalling $31,000 were issued to all permitted dischargers in the drainage that failed to meet KPDES permit limits for fecal coliform levels in their effluents. An improvement in water quality was found in May, 1993, and the swimming advisory was removed from approximately 76 miles in the lower portion of the drainage. However, numerous straight pipes (more than 1,200 in one county), which can discharge untreated waste, were found in the upper portion of the drainage and are preventing the North Fork Kentucky River from attaining the primary contact recreational use. Until fecal coliform levels are acceptable for swimming in the upper portion of the North Fork Kentucky River, the swimming advisory will remain in effect.

Nonpoint source (Section 319) funds have been secured under the federal fiscal year 1994 grant to help implement a single on-site wastewater project for several homes at a location to be determined in the North Fork Kentucky River basin. These funds will also be used for education, enforcement, monitoring, and best management practices implementation.

Table 1-17
Fish Kill Summary

		1992	1993	Total
Severity:	Light(<100)	3	2	5
	Moderate (100-1,000)	0	0	0
	Major (>1,000)	6	0	6
	Unknown	7	3	10
	Total	16	5	21
Cause:	Sewage (WWTP)	1	1	2
	Agricultural operation	2	0	2
	Mining or oil operation	2	0	2
	Oil or chemical spill	8	3	11
	Natural (low D.O., etc.)	0	1	1
	Herbicides	0	0	0
	Unknown	3	0	3
	Total	16	5	21
River Basin:	Big Sandy	0	0	0
	Licking	1	1	2
	Kentucky	3	1	4
	Salt	2	1	3
	Green	3	0	3
	Upper Cumberland	2	0	2
	Lower Cumberland	1	0	1
	Tennessee	1	0	1
	Ohio tributaries	3	2	5
	Total	16	5	21
Approximate number of stream miles		34.45	4.31	38.76
Estimated number of fish killed		100,859	60	100,919

Table 1-18
Fish Kill Synopsis, 1980-1993

Year	Number of Incidents	Number of Waterbodies	Stream Miles Affected	Surface Acres Affected	Number Fish Killed	Number Major Fish Kills*	Known Causes
1980	24	25	53.2	-	22,413	10	10
1981	26	30	74.3	-	81,266	7	10
1982	26	28	52.0	72.0	98,436	5	12
1983	36	41	51.3	7.0	76,187	8	19
1984	33	35	67.3	47.5	106,514	7	18
1985	29	27	86.9	4.5	59,499	5	9
1986	23	20	23.3	47.0	129,583	10	9
1987	30	32	58.3	200.0	229,583	10	14
1988	19	16	105.6	-	319,212	10	10
1989	23	23	47.8	9.0	222,330	9	11
1990	16	17	19.4	1.10	74,170	5	5
1991	17	18	36.9	25.0	60,038	7	7
1992	16	18	34.45	-	100,859	6	13
1993	5	5	4.31	-	60	0	5

*> 1000 fish killed

An intensive survey was conducted in July and August, 1993 in the upper Cumberland River basin. Water and wastewater samples for fecal coliform analysis were collected on two occasions at 21 mainstem stations and 43 tributary stations, as well as from the effluents of nine municipal wastewater treatment plant facilities (Williamsburg, Barbourville, Pineville, Loyall, Harlan, Cumberland, Benham, Lynch, and Evarts). Instream stations included five water plant intake locations (Williamsburg, East Knox, Harlan, Cumberland and Cawood), four USGS gaging stations, and one drain pipe.

Based on the fecal coliform data from those two sampling events, a swimming advisory should be considered on the mainstem in the area of Pineville, Harlan, and Loyall and on several tributaries. Four of nine municipal facilities tested did not meet KPDES permit limits for fecal coliform bacteria (Williamsburg, Pineville, Loyall, and Evarts). The effluents of Williamsburg, Pineville, and Evarts were indicative of raw sewage with little or no disinfection. Straight pipes, which can discharge raw sewage, were also observed during the survey.

Fecal coliform data will be collected again in 1994 in the upper Cumberland basin. Results of this sampling will determine if a swimming advisory will be issued. Poor Fork, Clover Fork, Catron Creek, Martins Fork, and their tributaries will be included in the 1994 sampling effort.

The DOW sampled Three-Mile Creek, Banklick Creek, and the lower Licking River in Campbell and Kenton counties in 1991 and found they were polluted by fecal coliform bacteria. Advisories were sent to residents, creeks were posted, and notices were published in local newspapers about the risk of swimming in these waters. The DOW and the University of Kentucky, the latter with Clean Water Act Section 104(b) funds awarded to the DOW, continued to monitor these areas for CSO impacts. The data indicated the problems were persisting, and the advisory was re-issued in July, 1993.

Houseboat slip and dock areas and other lake sites have been monitored for fecal coliform bacteria levels on a monthly basis during the recreation season on Lake Cumberland since 1988 and on Laurel River Lake in 1993. Both lakes had low bacteria counts and are considered to be safe for swimming.

Fishtrap, Dewey, and Paintsville Lakes were sampled by the Big Sandy Area Development District for bacteria at three recreation areas each during the 1993 recreational season. All of the lakes fully supported the swimming use.

The Nonpoint Source Section of the DOW is conducting a water quality monitoring demonstration project for the Fleming Creek watershed in the Licking River basin in Fleming County. The main purpose of this project is to document water quality changes as a result of animal waste best management practices implementation. The initial element of the Fleming Creek monitoring program involved a high-flow/low-flow, watershed-wide bacteriological survey. Data collected pursuant to this survey indicate that several tributaries within the watershed are use impaired for swimming use, including Allison Creek, Craintown Branch, Sleepy Run and Wilson Run. Several other tributaries have been determined to be partially impaired, including Poplar Creek, Flat Run, Cassidy Creek, and Logan Run.

Beach Closures

No state park beaches were closed during the 1992 or 1993 recreational seasons because of fecal coliform bacteria contamination. The Department of Parks built a swimming pool at Fort Boonesboro State Park that replaced the beach as a swimming area. The Department of Parks monitored the following state park beaches.

Barren River Lake	Rough River Lake
Lake Barkley	Green River Lake
Kenlake	Buckhorn Lake
J.J. Audubon (Scenic Lake)	Lake Malone
Fort Boonesboro (Kentucky River)	Greenbo Lake
	Pennyrile Lake

CHAPTER 2

WETLANDS

WETLANDS

Jurisdictional Wetlands

Wetlands are included as surface waters of the Commonwealth in Kentucky water quality standards regulations 401 KAR 5:029. Wetlands are defined in that same regulation as land that has a predominance of hydric soils and that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of hydrophytic vegetation typically adapted for life in saturated soil conditions. All wetlands have three key attributes: (1) characteristic hydric soils that become flooded, saturated, or ponded long enough during the growing season to develop anaerobic conditions in the upper layers; (2) plants that tolerate and thrive in such conditions; and (3) a degree of flooding, saturation, or ponding during the growing season to sustain characteristic soils and vegetation. Jurisdictional wetlands are delineated by the U.S. Army Corps of Engineers (COE) in accordance with the COE Wetlands Delineation Manual (Technical Report Y-87-1, January 1987). Farmed wetlands, prior converted croplands, and other agricultural lands where the natural vegetation has been removed are delineated by the Soil Conservation Service (SCS) in accordance with the National Food Security Act Manual, Third Edition (NFSAM).

Wetland Functions and Designated Uses

Wetlands perform many useful functions depending on the wetland type and position within the landscape. Landscape position affects both the opportunity to perform these functions and the wetland community that has developed through nutrient and water availability. The following uses are potentially supported by wetlands:

1. Flood conveyance - Riverine wetlands and adjacent palustrine wetlands form natural floodways that convey flood waters from upstream to downstream points.

2. Flood storage - Wetlands act as natural reservoirs by storing water during floods and slowly releasing it to downstream areas, thereby lowering flood peaks.

3. Sediment and erosion control - Wetlands reduce velocity of flood water, which reduces erosion and sediment deposition.

4. Habitat for fish - Wetlands are important spawning areas and provide food sources for fish species.

5. Habitat for waterfowl and other wildlife - Wetlands provide essential breeding, nesting, feeding, and predator escape habitats for many forms of waterfowl, other birds, mammals, and reptiles.

6. Habitat for rare and endangered species - 55 percent of all rare and endangered species in Kentucky are either located in wetland areas or are dependent on them.

7. Recreation - Wetlands serve as recreation sites for fishing, hunting, and observing wildlife.

8. Water supply - With the growth of urban centers and dwindling ground and surface water supplies, wetlands are increasingly important as a source of ground and surface water.

9. Education and research - Inland wetlands provide educational opportunities for nature observation and scientific study.

10. Water Quality - Wetlands improve water quality by removing excess nutrients, sediments, and chemical contaminants.

__Wetland Mitigation__

Consistent with Section 401 and Kentucky water quality standards, wetland impacts should be avoided or minimized whenever possible. EPA has recommended in its guidance on administering the 401 Water Quality Certification program (discussed further in Chapter 4) that states use the COE regulations as outlined in the 404 (b) (1) guidelines (40 CFR Part 230) when determining whether to issue or deny 401 certifications. When unavoidable impacts occur as a result of the permitting process or as a result of an illegal fill subject to enforcement, mitigation is required to compensate for wetland acreage and functions lost.

Mitigation and monitoring plans are developed in accordance with interagency guidelines that have been prepared by DOW, Louisville COE, U.S. Fish and Wildlife Service, EPA, and Kentucky Department of Fish and Wildlife Resources. The "Wetland Compensatory Mitigation and Monitoring Plan Guidelines for Kentucky" are designed to assist applicants in preparing mitigation plans for agency review. The guidelines outline technical information that should be included to establish and monitor hydric soils, hydrophytic vegetation, and hydrology at the mitigation site. Mitigation usually includes restoration of wetland functions in prior converted cropland sites rather than enhancement or creation of wetlands.

Attainment of functional equivalency should be the goal of all mitigation activities. The choice of restoration, creation, or enhancement mitigation for any project depends upon the site-specific characteristics of available locations. The choice should be based upon analysis of factors that limit the ecological functioning of the watershed, ecosystem, or region. Mitigation should be initiated either before or at the same time that the proposed project work is being undertaken. The mitigation plan must be made part of the project application. Where an activity does not result in a permanent loss, on-site restoration and compensatory mitigation should occur.

The DOW will have the capability to report wetland acres permanently lost and wetland acreage compensated by mitigation actions in the next 305(b) report.

Wetland Classes and Extent

The majority of Kentucky's wetlands are classified as palustrine ecological systems as defined by the U.S. Fish and Wildlife Service's Cowardin classification system that was developed in 1979. Palustrine systems are freshwater wetlands in a concave or depressional landform relative to the surrounding landscape. They are dominated by hydrophytic trees, shrubs, and herbaceous plant species. They are often referred to as bottomland hardwood, floodplain, marsh, oxbow, scrub-shrub, swamp, and wet meadow. Hydrologically, palustrine systems in Kentucky are often linked to an adjacent riverine system; however, hydrologically isolated depressional systems that are maintained by precipitation also occur in the state. Flooding events in palustrine systems are extremely variable during the growing season, ranging from permanently flooded to temporarily flooded areas. Groundwater discharge plays an important role in maintaining surface water depths in many permanently flooded areas. However, even in temporarily flooded areas where surface water may be present for brief periods during the growing season, the water table lies below the soil surface and sustains hydrophytic vegetation and hydric soils.

Riverine systems include all wetlands and deepwater habitats contained within a channel that experience continuously or periodically moving water or connect two bodies of standing water. While wetlands of this type are not extensive in Kentucky, they sustain the surface hydrology for palustrine systems and convey flood waters. The riparian zone of riverine systems provides habitat for wildlife, depresses water temperature through shading, stabilizes stream banks, and reduces sedimentation to streams and wetlands.

Lacustrine systems include deep-water habitats in lakes and reservoirs that are situated in a topographic depression or dammed river channel. Vegetative cover is less than 30 percent, and total area usually exceeds 20 acres. These systems are usually limited in Kentucky to man-made lakes and their associated shorelines and spillways. The subsystems of lacustrine wetlands are described as limnetic (deepwater habitat) and littoral (shoreline habitat).

In 1985, the DOW provided funding to the Kentucky State Nature Preserves Commission to determine the status of Kentucky's wetlands. Recommendations for protection of remaining wetland areas were contained in the report Wetland Protection Strategies for Kentucky (KNPC, 1986). Among the Commission's findings was a rough estimate that, as of 1978, 637,000 acres remained of the original 1,566,000 acres of palustrine wetlands in Kentucky. Further, it was estimated that only 20 percent of Kentucky's wetland soils remained forested, which reflected a dramatic decline in bottomland hardwood wetlands. The Kentucky Department of Fish and Wildlife Resources estimated Kentucky's annual rate of wetland loss at 3,600 acres (KDFWR 1990). The Environmental Quality Commission (NREPC 1992) reported that only 360,000 acres of palustrine wetlands remained.

In 1988, the Kentucky Department of Fish and Wildlife Resources provided funding to the Natural Resources and Environmental Protection Cabinet (NREPC) to digitize all of the National Wetland Inventory (NWI) maps for Kentucky. The wetlands presented on these maps were identified through the use of stereoscopic analysis of high altitude aerial photography and reflect conditions observed during the period of March 1980 - April 1984. The maps were produced by the U.S. Fish and Wildlife Service's NWI office in St. Petersburg, Florida. The NREPC completed the digitization project in December, 1992.

Based upon the digital information, Table 2-1 and Appendix C report the acreage of wetland types as defined by the Cowardin Classification System for waterbodies in the state. Palustrine systems are separated into forested, scrub-shrub, emergent, and other palustrine, the latter which includes unconsolidated bottom, unconsolidated shore, and open water. Acreages of palustrine vegetated (forested, scrub-shrub, and emergent) wetland types for each river basin in Kentucky are listed in Table 2-2. Lacustrine systems are separated into limnetic and littoral. Riverine systems are grouped as one unit.

The acreages in Appendix C provide basic information on wetland types and distribution in the state and should be used for planning purposes, such as watershed management and protection projects. The reported acreages must not substitute for an on-site jurisdictional wetland delineation for site-specific projects that may impact wetland areas.

Wetlands as Outstanding Resource Waters

Wetlands classified as Outstanding Resource Waters (ORW) must meet the criteria as designated in 401 KAR 5:031(7). Currently, three of Kentucky's wetlands have been designated as ORWs: Metropolis Lake in McCracken County, Murphy's Pond in Hickman County, and Swan Lake in Ballard County. These ORWs have been designated for the uses of warmwater aquatic habitat and contact recreation. Other wetlands will continue to be evaluated for the ORW designation.

Water Quality Standards for Wetlands

Kentucky water quality standards include wetlands as waters of the state, but do not provide specific wetlands criteria. As waters of the state, wetlands are designated for the uses of warmwater aquatic habitat and contact recreation.

The DOW is working from a grant received in 1991 under Section 104(b)(3) of the Clean Water Act to address deficiencies in the water quality standards regarding wetlands protection. Under this grant, selected wetlands were added to the reference reach monitoring program. Representative wetlands were selected within physiographic regions for monitoring to characterize chemical water quality, sediment quality, fish tissue, habitat condition, and general biotic conditions. From this information, decisions will be made regarding designation of appropriate use classifications, modifications to numerical chemical criteria, and development of narrative or numerical biocriteria. This information should be available for use during Kentucky's next triennial review.

Table 2-1: Current Extent of Wetlands by Type

Type	Acreage
Palustrine Forested (FO)	267,058
Palustrine Scrub Shrub (SS)	27,920
Palustrine Emergent (EM and AB*)	28,940
Palustrine Other ** (OTH)	117,562
Lacustrine Limnetic (L-1)	310,487
Lacustrine Littoral (L-2)	10,282
Riverine (R)	74,622
Total:	**836,871**

* Includes aquatic bed classes

** Includes classes of unconsolidated bottom, unconsolidated shore, and open water

Table 2-2: Acreage of Palustrine Vegetated (PFO, PSS, PEM, PAB) Wetland Types in River Basins of Kentucky

River Basin	Acreage
Big Sandy	860.2
Little Sandy	2,186.2
Tygarts Creek	364.1
Licking	3,274.4
Kentucky	5,507.1
Upper Cumberland	10,759.9
Salt	3,482.0
Green	87,584.0
Tradewater	29,578.4
Lower Cumberland	19,164.5
Tennessee	36,838.2
Mississippi	67,096.9
Ohio River Minor Tribs	40,057.9
Ohio River Mainstem	17,164.2
Total Palustrine Vegetated:	323,918.0

CHAPTER 3

WATER QUALITY ASSESSMENT OF LAKES

WATER QUALITY ASSESSMENT OF LAKES

Section 314 of the Clean Water Act of 1987 requires that states submit a lake water quality assessment as part of their biennial 305(b) report. Six areas to be included in the assessment are:

(1) An identification and classification according to eutrophic condition of all publicly owned lakes in a state.

(2) A general description of the state's procedures, processes, and methods (including land use requirements) for controlling lake pollution.

(3) A general discussion of the state's plans to restore the quality of degraded lakes.

(4) Methods and procedures to mitigate the harmful effects of high acidity and remove or control toxics mobilized by high acidity.

(5) A list and description of publicly owned lakes for which uses are known to be impaired, including those lakes that do not meet water quality standards or that require implementation of control programs to maintain compliance with applicable standards, and those lakes in which water quality has deteriorated as a result of high acidity that may reasonably be attributed to acid deposition.

(6) An assessment of the status and trends of water quality in lakes including the nature and extent of pollution loading from point and nonpoint sources and the extent of impairment from these sources, particularly with regard to toxic pollution.

The U.S. Environmental Protection Agency (EPA) has developed a guidance document Guidelines for the Preparation of the 1994 State Water Quality Assessments (305(b) Reports) (May, 1993), which includes a section on lake assessment reports. Kentucky's report generally complies with the guidelines suggested by the EPA.

Lake Identification

Appendix D lists publicly owned lakes for which data were available to assess trophic status. Much of this information came from recent lake surveys (1989-1991) conducted by the Division of Water (DOW) and Murray State University as part of a cooperative agreement funded under Section 314 of the Clean Water Act. The surveys were conducted on lakes that had originally been sampled by the DOW in 1981-1983 and on 11 lakes that had not previously been surveyed. More recent surveys on a few lakes, conducted by DOW, the U.S. Army Corps of Engineers, and Murray State University (Kentucky Lake), were also utilized. Not all of the significant publicly owned lakes in Kentucky are included in the table because data have not been collected from all of these lakes. For purposes of this report, publicly owned lakes are those lakes that are owned or managed by a public entity such as a city, county, state, or federal agency where the public has free access for use. A nominal fee for boat launching charged by concessionaires may occur on some of these lakes. Lakes that are publicly owned, but have restricted public access because they are used solely as a source of domestic water supply, are not included. These lakes do not qualify for federal restoration funds under the Clean Lakes Program and were not monitored in the lake classification survey. In addition, Lewisburg Lake in Logan County has been removed from the list of significant lakes because public access has been restricted. Yatesville Lake, a newly impounded reservoir in Lawrence County, has been added. EPA guidance suggests that all significant lakes be included in state surveys. The term "significant" is to be defined by the state so that all lakes that have substantial public interest and use are included. For this purpose, Kentucky considers all of the publicly owned lakes it has surveyed and listed in Appendix D and also those that have not yet been surveyed, but qualify as publicly owned lakes, as significant. All of these lakes have substantial local or regional public interest and use.

Trophic Status

Lake trophic state was assessed by using the Carlson Trophic State Index (TSI) for chlorophyll *a*. This method is convenient because it allows lakes to be ranked numerically according to increasing eutrophy and also provides for a distinction (according to TSI value) between oligotrophic, mesotrophic and eutrophic lakes. The growing season average TSI (chlorophyll *a*) value was used to rank each lake. Growing season was defined as the April through October period. A distinction was made for those lakes that exhibited trophic gradients. If lakes exhibited trophic gradients or embayment differences, those areas were often analyzed separately.

While there are several other methods of evaluating lake trophic state, the accuracy and precision of the chlorophyll *a* analytical procedure (determined from DOW quality control data) and proven ability of the chlorophyll *a* TSI to detect changes made it the index of choice for classifying lakes in Kentucky's program.

Chlorophyll *a* concentration data from the DOW ambient monitoring program and the most current chlorophyll *a* data collected during the spring through fall seasons (a minimum of three samples) by the U.S. Army Corps of Engineers (COE) on several reservoirs which they manage were used to update the trophic classifications for this report. Other data were obtained from a study of Kentucky Lake conducted by Dr. David White of Murray State University. Data averaged from water column depths of up to 20 feet were used in calculating TSI values. Table 3-1 contains the trophic state rankings of lakes of 5,000 acres or more in size, and Table 3-2 lists and ranks the trophic state of lakes less than 5,000 acres in size. Lakes that have updated classifications are in bold face type. A "+" or "-" symbol is used to indicate a trend of increasing or decreasing trophy. Trends were defined as a change of 10 units from a previous TSI score. This represents a doubling or halving of Secchi disk depth and was chosen because it is an observable indication of change.

A summary of Tables 3-1 and 3-2 indicates that of the 103 classified lakes, 61 (59%) were eutrophic (3 were hypereutrophic), 33 (32%) were mesotrophic, and 9 (9%) were oligotrophic. Three lakes in eastern Kentucky, Fishtrap, Martins Fork, and Grayson, changed from an oligotrophic to mesotrophic classification based on recent survey data. The trophic analysis is based on the status of the major areas of lakes and does not account for the trophic gradient that exists in some reservoirs nor the trophic status of the embayments of others. The dynamic nature of these reservoirs makes it more difficult to assign them a single trophic state because their water residence times, the nature of major inflows, and their morphology can result in different trophic states in separate areas. The tables indicate that trophic gradients exist in Barren River and Laurel River lakes and that certain embayments of Lake Cumberland are eutrophic, while the main lake area is oligotrophic.

The 103 assessed lakes have a total area of 217,250 acres. This is an increase of 2,288 acres from the 1992 report. A new impoundment of Laurel Creek Lake which flooded the old impoundment increased the size of the lake by 46 acres, and the newly impounded Yatesville Lake added 2,242 acres to the total. Only those portions of lakes Barkley, Kentucky, and Dale Hollow lying within Kentucky were included in the total. Tennessee reports on those portions within its borders. Of the total, 50 percent (109,261 acres) were eutrophic, 28 percent (60,268 acres) were oligotrophic, and 22 percent (47,721 acres) were mesotrophic. The increase in eutrophic acres from the 1992 305(b) report is because of the inclusion of the Pitman Creek embayment of Lake Cumberland. The decrease in oligotrophic acres was a result of the reassessments of Fishtrap, Martins Fork, and Grayson lakes.

Lake Pollution Control Activities

Kentucky utilizes several approaches to control pollution in its publicly owned lakes. The approach chosen is dependent upon the pollutant source and the characteristics of each lake. Point sources of potential pollution are more controllable than nonpoint sources. The following procedures are routinely used to control point sources of pollution.

Permitting Program

A lake discharge guidance procedure is applied to any new construction permit for a wastewater treatment facility that proposes to discharge into a lake, or for any application for a lake discharge permit under the Kentucky Pollutant Discharge Elimination System (KPDES). An applicant is required to evaluate all other feasible means of routing the discharge or to explore alternate treatment methods that would result in no discharge to a lake. If no reasonable alternatives are found, a lake discharge may be permitted. Permits for domestic wastes require secondary treatment and a discharge into the hypolimnion in the main body of the lake. More stringent treatment may be required depending upon lake characteristics. Surface discharges are not allowed. A permit may also be denied to a prospective discharger if the discharge point is within five miles of a domestic water supply intake.

Table 3-1
Trophic State Rankings for Lakes
5,000 Acres or Greater in Area
(by Carlson TSI (Chl α) Values)

Lake	TSI (Chl a)*	Acres
	Eutrophic	
Barkley	61	45,600
Kentucky	**53**	**48,100**
	Mesotrophic	
Barren River	50	7,205
Beaver Creek Arm	57 (Eutrophic)	1,565
Skaggs Creek Arm	50	1,230
Green River	48	8,210
Rough River	48	5,100
Cave Run_	45	8,270
Nolin	43	5,790
	Oligotrophic	
Cumberland	38	49,108
Pitman Creek Embayment	**54 (Eutrophic)**	**256**
Lily Creek Embayment	**59 (Eutrophic)**	**144**
Beaver Creek Embayment	57 (Eutrophic)	742
Laurel River	**38**	**4,990**
Midlake-Laurel River Arm	**43 (Mesotrophic)**	**754**
Headwaters-Laurel River Arm	**52 (Eutrophic)**	**316**
Dale Hollow	33	4,300

*Scale: 0-40 Oligotrophic (nutrient poor, low algal biomass)
41-50 Mesotrophic (slightly nutrient rich, moderate amount of algal biomass)
51-69 Eutrophic (nutrient rich, high algal biomass)
70-100 Hypereutrophic (very high nutrient concentrations and algal biomass)
Bold Type = Updated Classifications

Table 3-2
Trophic State Rankings for Lakes
Less Than 5,000 Acres in Area
(by Carlson TSI (Chl *a*) Values)

Lake	TSI (Chl *a*)*	Acres
	Hypereutrophic	
Beaver Dam	86	50
Mitchell	85	58
Happy Hollow	75	20
	Eutrophic	
Swan	69	193
Arrowhead	68	37
Fish	68	27
Spurlington	68	36
Campbellsville City	67	63
Marion County	67	21
Guist Creek	65	317
Wilgreen	65	169
Shelby (Shelby County)	64	17
Buck	64	19
Metcalfe County	64	22
Willisburg	64	126
Briggs	63	18
Kingfisher	63	30
Metropolis	63	36
Flat	62	38
Greenbriar**	62	66
McNeely	**62**	**51**
Taylorsville	**62**	**3,050**
Carpenter	61	64
Doe Run	61	51
Jericho	**61**	**137**
Sympson	61	184
Burnt Pond	60	10
Long Pond	60	56
Moffit	60	49

Table 3-2 (Continued)

Lake	TSI (Chl *a*)*	Acres
Shelby (Ballard County)	60	24
Turner	60	61
Carnico	59	114
Scenic	59	18
A.J. Jolly	58	204
Energy	58	370
Reformatory	**58**	**54**
Corinth	57	96
Freeman	57	160
Sand Lick	57	74
Beaver	56	158
Bullock Pen	56	134
Elmer Davis	56	149
Kincaid	56	183
Malone	56	826
Mauzy	56	84
Spa	56	240
Washburn	56	26
Boltz	55	92
General Butler	55	29
George	55	53
Fishpond	54	32
Herrington	54	2,940
Salem	54	99
Shanty Hollow**	54	135
Carr Fork	53	710
Pennyrile	53	47
Williamstown**	53	300
Caneyville	52	75
Bert Combs	51	36
	Mesotrophic	
Chenoa	50	37
Corbin	50	139
Dewey	50	1,100
Liberty	50	79
Long Run	50	27

Table 3-2 (Continued)

Lake	TSI (Chl *a*)*	Acres
Morris	50	170
Beshear	49	760
Hematite	49	90
Honker	49	190
Laurel Creek	49	88
Linville	49	273
Pan Bowl	49	98
PeeWee	49	360
Grayson	**48**	**1,512**
Greenbo	48	181
Luzerne	48	55
Mill Creek (Monroe County)	48	109
Smokey Valley	47	36
Tyner	46	87
Wood Creek	46	672
Blythe	45	89
Campton	45	26
Mill Creek (Powell County)	43	41
Paintsville	**43**	**1,139**
Yatesville	**43**	**2,242**
Providence City	42	35
Fishtrap	**42**	**1,143**
Martins Fork	**42**	**334**
Grapevine	41	50
	Oligotrophic	
Cranks Creek	**39**	**219**
Buckhorn	38	1,230
Loch Mary	38	135
Stanford	36	43
Cannon Creek**	33	243

*Scale: 0-40 Oligotrophic 51-69 Eutrophic
41-50 Mesotrophic 70-100 Hypereutrophic
Bold Type = Updated Classifications, ** = 2 samples only,
+/- = upward (more eutrophic) or downward (less eutrophic) trend

Nonpoint Source Program

The NPS section of the DOW is engaged in numerous activities that protect Kentucky's lakes. These activities, including demonstration projects, education, implementation of best management practices, and technical assistance are described in detail in Chapter 5.

Water Quality Standards Regulations

Kentucky has not adopted specific criteria to protect lake uses. Warmwater aquatic habitat, domestic water supply (if the lake is used for this purpose), and primary and secondary contact recreation criteria are generally applicable to lakes. In specific cases, a provision in the water quality standards regulation can be utilized to designate a waterbody as nutrient limited if eutrophication is a problem. Point source dischargers to the lake and its tributaries can then have nutrient limits included in their permits.

Lakes that support trout are further protected by another provision that requires dissolved oxygen in waters below the epilimnion to be kept consistent with natural water quality.

Kentucky is not planning to adopt statewide criteria specifically for lakes. A site-specific approach to lake pollution control is more realistic and feasible.

Specific Lake Legislation and Local Initiatives

The Kentucky General Assembly passed specific legislation in 1984 to protect Taylorsville Lake. House Joint Resolution No. 4 prohibits issuing any discharge permits that allow effluents to be directly discharged into the lake. It also prohibits issuing any permits that allow inadequately treated effluents to be discharged into contributing tributaries that drain the immediate watershed of the lake. In addition, wastewater permit applications in the basin above the lake must be evaluated to ensure that discharges will not adversely affect the lake or its uses. Other provisions provide for stringent on-site wastewater treatment requirements, promotion of nonpoint source controls, and proper management of sanitary landfills in the watershed.

Lake protection associations are not formally organized in Kentucky, although this is a mechanism that has proven to be successful in preventing lake pollution in other states. Local ordinances can be passed that restrict land use activities and on-site treatment systems and lead to pollution abatement. Local grass roots opposition to activities that may degrade lakes can lead to state agency action. An example is the petition process in the state's surface mining regulations which can lead to lands being declared unsuitable for mining. Such a petition has been successfully made to protect the water quality of Cannon Creek Lake in Bell County. The lake is used as a water supply for the city of Pineville and is also used for fishing and recreation.

The Lake Cumberland Trust, the Sierra Club, and Trout Unlimited opposed the change in the location of the discharge of the Russell County Regional Wastewater Treatment Plant from a tributary of Lake Cumberland to the main lake. A technical advisory committee consisting of representatives of the parties involved came to a resolution that allowed the discharge but also instituted pollution prevention initiatives by the major wastewater industrial contributor and an assessment of environmental effects. The main lake discharge became operational in April 1993. Early sampling has shown that the discharge plume is remaining well below the surface and is being diluted even more rapidly than modeling predictions.

Lake Monitoring

Monitoring water quality in lakes is a part of Kentucky's ambient monitoring program and is described in Chapter 1. The objectives of the monitoring program are flexible so that lakes can be monitored for several purposes, including:

- detection of trends in trophic state
- impacts of permit decisions
- ambient water quality characterization
- nonpoint source impacts
- long-term acid precipitation impacts
- pollution incidences such as fish kills and nuisance algal blooms
- new initiatives such as fish tissue analysis for toxics and fecal coliform surveys in swimming areas.

Lake Restoration Plan

Kentucky has not developed a formal state Clean Lakes Program. Several states have adopted programs modeled after the federal Clean Lakes Program and have had state funds appropriated to aid in lake restoration projects. The impetus for developing these programs has been the historical importance of lakes as recreational and aesthetic resources in these states. Pollution or the potential for pollution has prompted support for state development of these programs. Pollution of lakes in Kentucky has not reached a point at which there is a recognized need to develop a state program of this nature.

However, the DOW does participate in the federal Clean Lakes Program. The Natural Resources and Environmental Protection Cabinet is the state agency designated by the Governor to receive federal assistance under this program. Kentucky has received six assistance awards. Two helped to fund projects that classified lakes in the state according to trophic state and assessed their need for restoration. One award helped to fund a 1993 study conducted by the Big Sandy Area Development District to determine fecal coliform levels in recreation areas of Dewey, Fishtrap, and Paintsville lakes. Another part of that award was used by DOW to start a fish tissue contamination survey of Kentucky lakes. Barkley Lake and Taylorsville Lake were the first two lakes surveyed. Results will be reported in the 1996 305(b) report. Two projects, through the assistance of state universities, are studying the trophic state of selected reservoirs. The other award helped to fund a diagnostic/feasibility study of McNeely Lake in Jefferson County.

The DOW cooperated with local and federal agencies in all of these projects and prepared a grant for implementation of the restoration plan for McNeely Lake. The grant was not awarded because McNeely Lake was not technically eligible for assistance under federal guidelines. However, Jefferson County passed a bond issue to finance the implementation of the plan. It was completed in December, 1988. The DOW monitored the lake as part of its ambient program to document water quality improvements.

The DOW is ready to cooperate with local agencies and other interested groups to participate in the federal Clean Lakes Program. The preparation of the lake assessment chapter in the 305(b) report is a requirement for future participation in that program.

Toxic Substance Control/Acid Mitigation Activities

Kentucky does not have publicly owned lakes that have high acidity caused by acid precipitation; consequently, this requirement does not apply and will not be addressed.

Identification of Impaired and Threatened Lakes

Table 3-3 summarizes information on overall use support for Kentucky lakes. This information was gathered from published annual reports produced by the COE on reservoirs which they manage, from research reports by other investigators, and from DOW data bases. The total acres assessed are equal to the acres monitored. The analysis is based on chemical data relating to pH, manganese, and dissolved oxygen problems, biological data relating to algal biomass (blooms), taste and odor problems caused by algae, macrophyte infestations, and fish kill reports. Criteria were also developed based on other indicators of lake use support (see Table 3-4). A questionnaire was sent to operators of drinking water facilities that use lakes as raw water sources to assess use impairment. They responded to questions relating to taste and odor problems and the degree of treatment used to combat the problem. One of the criteria for support of aquatic life indicates that a use was partially supported if the average dissolved oxygen concentration within the epilimnion was between 4 and 5 mg/l and not supported if the dissolved oxygen was less than 4 mg/l. This change in criteria from previous reports was made to better categorize lakes based on the severity of oxygen depletion. This criterion and pH are related to aquatic life water quality standards.

The total acres reported in Table 3-3 are based on the DOW's Dam Inventory Files and the acres inventoried in the lake classification program. The assessed acres represent more than 90 percent of the publicly owned lake acreage in the state. EPA published a draft document in October, 1993 that updated a previous document titled Total State Waters: Estimating River Miles and Lake Acreages for the 1992 Water Quality Assessments (305(b) Reports). Total lake acreage in Kentucky is now listed at 225,097 acres. The acreages are

Table 3-3
Summary of Lake Use Support

Degree of Use Support	Assessment Basis (Monitored)	Percent (by acres)
Acres Fully Supporting	98,585	45
Acres Supporting But Threatened	94,839	44
Acres Partially Supporting	20,510	9
Acres Not Supporting	3,316	2
Total Acres Assessed*	217,250	

*Total Kentucky Lake Acreage - 228,385

derived from USGS 1:24,000 scale maps for lakes shown on the USGS 1:100,000 scale map series. This total is less than the estimate in this report. The DOW derived its estimate of lake acreages from engineering drawings in its Dam Inventory Files, from reported acres (at certain elevations) in U.S. Army Corps of Engineers project reports of its major reservoirs in the state, and by planimetering USGS 1:24,000 scale maps for lakes with no reported acres. These are considered to be more accurate estimates than those reported by U.S. EPA. Total surface area of lakes in the state is unknown.

Many lakes have been classified by use in Kentucky and are listed in Kentucky's water quality standards. Waters not specifically listed by use in water quality regulations are generally classified for the uses of warmwater aquatic habitat, primary contact (swimming), secondary contact recreation, fish consumption, and domestic water supply at points of withdrawal. Lake use support is based on these uses. Primary contact recreation was not assessed because sampling was not conducted for the primary indicator of use support (fecal coliform bacteria). The DOW has recently begun a program to monitor lakes for fecal coliform bacteria in recreation areas in order to determine primary contact use support. This program is discussed in the last section of this chapter.

Detailed information on formerly assessed lakes can be found in the report on the lake classification program titled Trophic State and Restoration Assessments of Kentucky Lakes, which was published in 1984 by the DOW. Detailed information on newly assessed lakes will be included in the final report of the lake assessment project. Appendix D lists summary information on all of the lakes assessed.

Table 3-4
Criteria for Lake Use Support Classification

Category	Warmwater Aquatic Habitat	Secondary Contact Water Recreation	Domestic Water Supply
Not Supporting:	At least two of the following:	At least one of the following:	At least one of the following:
	1. Fish kills caused by poor water quality	1. Widespread excess macrophyte/macroscopic algal growth	1. Chronic taste and order complaints caused by algae
	2. Severe hypolimnetic oxygen depletion	2. Chronic nuisance algal blooms	2. Chronic treatment problems caused by poor water quality
	3. Dissolved oxygen average less than 4 mg/l in the epilimnion		
Partially Supporting:	1. Dissolved oxygen average less than 5 mg/l in the epilimnion	1. Localized or seasonally excessive macrophyte/macroscopic algal growth	1. Occasional taste and odor complaints caused by algae
(At least one of the listed criteria)	2. Severe hypolimnetic oxygen depletion	2. Occasional nuisance algal blooms	2. Occasional treatment problems caused by poor water quality
	3. Other specific cause (i.e. low pH)	3. High suspended sediment concentrations during the recreation season	
		4. Other specific cause (i.e. low pH)	
Fully Supporting:	1. None of the above	1. None of the above	1. None of the above

Tables 3-5 and Table 3-6 list lakes that did not support or partially supported their uses. The tables indicate the criteria from Table 3-4 that were used to determine nonsupport or partial support and the probable causes and sources for the support not being achieved. Table 3-7 lists those lakes that fully support their uses.

Table 3-8 summarizes use support information for lakes based on acres and number of lakes. Eighty-six percent of the total acres assessed supported uses while 14 percent did not fully support uses. Of the 103 lakes assessed, 67 (65%) fully supported their uses, 31 (30%) lakes partially supported uses, and five (5%) lakes did not support one or more uses. Of lakes more than 5,000 acres in size, only Green River Lake did not fully support uses. Sixty-two percent (58 of 93) of the small lakes fully supported their designated uses. Thirty of these lakes (32%) partially supported a particular use. Five lakes did not support one or more uses. McNeely and Taylorsville lakes were removed from the nonsupport list and placed in the partial support category because of improved water quality. A reassessment of lakes used for drinking water supply resulted in Sympson, Rough River, Laurel Creek, Liberty and Morris lakes being upgraded from the partial support category to the full support category. A study by DOW of suspended solids effects on recreation use in eastern Kentucky reservoirs resulted in the upgrade of Martins Fork and Fishtrap lakes from the partial support category to the full support category. A successful aeration and grass carp introduction by the Kentucky Department of Fish and Wildlife Resources removed aquatic weed and low dissolved oxygen problems at Carpenter Lake, thus moving it from partial support to full support status. Fish consumption concerns arose in Green River Lake during this reporting period. Advisories are in effect against eating carp and channel catfish because of contamination from PCBs. Swimming in waters contaminated by bacteria was not considered to be a problem in any of the lakes.

EPA guidance asks for a list of threatened lakes. These are defined as lakes that fully support uses now, but may not in the future because of anticipated sources or adverse trends of pollution. Table 3-3 indicates the total acres classified as threatened. Table 3-9 lists the lakes, uses threatened, and the causes and sources of the threats.

Table 3-10 indicates the causes responsible for nonsupport of uses in lakes. As noted in previous 305(b) reports, nutrients caused the greatest percentage of nonsupport and affected the largest number of lakes. Nutrients can stimulate growth of algae, which may cause taste and odor problems in lakes used for domestic water supplies. Dissolved oxygen can also be lowered by very productive algal populations that stimulate microbial respiration and may result in fish kills or a decrease in oxygen to levels that are not conducive to the support of healthy populations of fish. Priority pollutants (PCBs) were the second leading cause of nonsupport. Suspended solids, the third largest contributor to nonsupport of uses, caused some reservoirs in eastern Kentucky to only partially support secondary contact recreational uses.

Table 3-5
Lakes Not Supporting Uses

Lake	Use Not Supported*	Criteria**	Cause	Source
Briggs	WAH	2,3	Nutrients	Lake fertilization
Corbin	DWS	1	Nutrients	Municipal point sources and Agricultural nonpoint sources
Herrington	WAH	1,3	Nutrients	Municipal point sources and Agricultural nonpoint sources, septic tanks
Loch Mary	DWS	2	Metals (Mn) and other inorganics (noncarbonate hardness)	Surface mining (abandoned lands)
Mauzy	WAH	2,3	Nutrients	Lake fertilization

*WAH - Warmwater Aquatic Habitat, SCR - Secondary Contact Recreation, DWS - Domestic Water Supply
**Refer to Table 3-4

Table 3-6
Lakes Partially Supporting Uses

Lake	Use*	Criteria**	Cause	Source
Beshear	WAH	1	Nutrients	Natural
Buckhorn	SCR	3	Suspended solids	Surface mining
Campbellsville	WAH	1	Nutrients	Agricultural nonpoint sources
	SCR	1	Shallow Lake Basin	Natural
Caneyville	DWS	1	Nutrients	Natural
	SCR	1	Shallow Lake Basin	Natural
Carr Fork	SCR	3	Suspended solids	Surface mining
	PCR	3	pH	Mining (abandoned lands)
Cranks Creek	WAH	3	pH	Mining (abandoned lands)
	SCR	3	pH	Mining (abandoned lands)
Dewey	SCR	3	Suspended solids	Surface mining
George	WAH	1	Nutrients	Agricultural nonpoint sources
Grapevine	DWS	1	Nutrients	Unknown
Green River	FC	N/A	Priority organics (PCBs)	Industrial point source
Guist Creek	DWS	1	Nutrients, Metals (Mn)	Agricultural nonpoint sources, Natural
	WAH	1	Nutrients	Agricultural nonpoint sources
Honker	WAH	1	Nutrients	Natural
Jericho	WAH	2	Nutrients	Agricultural nonpoint sources
Kincaid	WAH	1	Nutrients	Unknown
Luzerne	DWS	2	Nutrients	Unknown
Marion County	SCR	2	Nutrients	Lake fertilization
McNeely	WAH	1,2	Nutrients	In-place contaminants (Sediments)
Metcalfe County	SCR	1	Shallow lake basin	Natural
	WAH	2	Nutrients	Agricultural nonpoint sources

Table 3-6 (Continued)

Lake	Use *	Criteria**	Cause	Source
Pewee	DWS	1	Nutrients	Agricultural nonpoint sources
Reformatory	WAH	2	Nutrients	In-place contaminant (sediments)
Salem	SCR	1	Shallow Lake Basin	Natural
Sand Lick Creek	WAH	1	Nutrients	Agricultural nonpoint sources
	SCR	1	Shallow Lake Basin	Natural
Scenic	WAH	1	Nutrients	In-place contaminants (sediments)
Shelby (Shelby Co.)	WAH	1	Nutrients	Agricultural nonpoint sources/In-place contaminants (sediments)
Spa	WAH	1	Nutrients	Agricultural nonpoint sources
	SCR	1	Shallow Lake Basin	Natural
Stanford	DWS	1	Nutrients	Natural
Taylorsville	WAH	2,3	Nutrients	Agricultural nonpoint sources
Wilgreen	WAH	2	Nutrients	Septic tanks
	SCR	2	Nutrients	Septic tanks
Washburn	WAH	2	Nutrients	Unknown
Wood Creek	DWS	1	Nutrients	Septic tanks
Yatesville	WAH	1	Low dissolved oxygen/organic enrichment	Natural

*WAH - Warmwater aquatic habitat, SCR - Secondary contact recreation,
DWS - Domestic water supply, FC - Fish consumption, N/A - not applicable
**Refer to Table 3-4

Table 3-7
Lakes Fully Supporting Uses

Size		
5000 Acres or Larger	**Less than 5000 Acres**	
Barkley	A.J. Jolly	Linville
Barren	Arrowhead	Long Pond
Cave Run	Beaver	Long Run
Cumberland	Beaver Dam	Malone
Dale Hollow	Bert Combs	Martins Fork
Kentucky	Blythe	Metropolis
Laurel River	Boltz	Mill Creek (Monroe Co.)
Nolin	Buck	Mill Creek (Powell Co.)
Rough River	Bullock Pen	Mitchell
	Burnt Pond	Moffit
	Campton	Morris
	Cannon Creek	Paintsville
	Carnico	Pan Bowl
	Carpenter	Pennyrile
	Chenoa	Providence City
	Corinth	Shanty Hollow
	Doe Run	Shelby (Ballard Co.)
	Elmer Davis	Smokey Valley
	Energy	Spurlington
	Fish	Swan Pond
	Fish Pond	Sympson
	Fishtrap	Turner
	Flat	Tyner
	Freeman	Williamstown
	General Butler	Willisburg
	Grayson	
	Greenbo	
	Greenbriar	
	Happy Hollow	
	Hematite	
	Kingfisher	
	Laurel Creek	
	Liberty	

Table 3-8
Use Support Summary for Lakes

Use	Supporting	Supporting But Threatened	Partially Supporting	Not Supporting
		(by Acres*)		
Fish Consumption	209,040	0	8,210	0
Aquatic Life	157,084	49,239	7,885	3,042
Swimming	217,031	0	219	0
Secondary Contact	119,528	93,700	4,022	0
Drinking Water**	186,757	0	1,572	274
		(by Number*)**		
Fish Consumption	102	0	1	0
Aquatic Life	79	2	19	3
Swimming	101	0	2	0
Secondary Contact	89	2	12	0
Drinking Water****	32	0	7	2

*Total Assessed Acres = 217,250
**Total Assessed Acres for Domestic Water Supply = 188,603
***Total Assessed Lakes = 103
****Total Assessed for Domestic Water Supply = 41

Table 3-9
Threatened Lakes

Lake	Use Threatened*	Cause	Source
Kentucky	SCR	Macrophyte infestations	Natural or introduced exotic species
	WAH	Low dissolved oxygen	Unspecified nonpoint sources
Paintsville	WAH	Salinity/brine	Petroleum activities
Barkley	SCR	Suspended solids	Unspecified nonpoint sources

*SCR - Secondary Contact Recreation, WAH - Warmwater Aquatic Habitat

Table 3-10
Causes of Use Nonsupport* In Lakes

Major Impact**	Number of Lakes Affected	Acres	Percent Contribution (by Acres)
Nutrients	28	9,881	40
Priority organics (PCBs)	1	8,210	33
Suspended solids	3	3,040	12
Organic Enrichment	1	2,242	9
Other (shallow lake basin)	6	498	2
pH	1	219	1
Metals (Mn)	2	452	2
Other inorganics (noncarbonate hardness)	1	135	<1

* Nonsupport is a collective term for lakes either not supporting or partially supporting uses
** No moderate or minor impacts were noted

Table 3-11 indicates the sources responsible for nonsupport of lake uses. Industrial sources were the single source responsible for the highest percentage of use nonsupport (27%). Nonpoint sources, including agriculture, accounted for the highest percentage of lake uses not being supported (48%). More detailed studies in watersheds of the lakes in the agriculture category are necessary before contributing sources of nonpoint pollution can be distinguished. Surface coal mining and septic tanks are the other nonpoint source contributors to lake uses not being fully supported. Lake recreational uses are impaired because waters become turbid after receiving runoff laden with sediment from lands disturbed by surface mining activities. This turbidity reduces the incentive for secondary contact uses. Septic tank leachate contains nutrients that cause eutrophication and can impair aquatic life and domestic water supply uses. Natural causes and municipal point sources accounted for 13 and 10 percent of use nonsupport, respectively.

Water Quality Trend Assessment

Trophic Trends

One of the objectives of the ambient monitoring program is to assess eutrophication of Kentucky lakes. The monitoring strategy is to obtain at least two years of data during the growing season on each lake. After the data is assessed, a decision is made either to continue monitoring or to assess another lake.

Table 3-11
Sources of Use Nonsupport* in Lakes

Contributions Source	Major Impact (Acres)	Moderate/Minor Impact (Acres)	Percent (by Acres)
Point Sources			
Industrial	8,210		27
Municipal	3,079		10
Nonpoint Sources			
Agriculture	7,729		25
Septic Tanks	3,781	317	12
Surface Mining	3,394		11
Other			
Natural	4,125		13
Lake fertilization	123		<1
In-place contaminants	140		<1
Unknown	314		1

*Nonsupport is a collective term for lakes either not supporting or partially supporting uses.

A review of current lake data from the ambient monitoring program, STORET (for COE-managed lakes), the lake assessment program, and other reports resulted in an assessment of trophic trends at several lakes. As mentioned earlier, a change in the chlorophyll TSI value (averaged over the April - October growing season) of 10 units was used to indicate a trophic change. A discussion of trends from the above databases follows.

Lakes in the Assessment Program. TSI values were compared for those lakes assessed in 1981-1983 that were resurveyed in 1989, 1990, and 1991. Comparisons of two data sets does not provide a strong trend analysis because the intervening years were not sampled. They do, however, indicate a change. The comparisons showed that Spurlington, Campbellsville City, Shelby (Shelby County), Metcalfe County, and Doe Run lakes were more eutrophic. Wood Creek Lake and Dewey Lake changed from oligotrophic to mesotrophic states. Sympson Lake changed from a mesotrophic to a eutrophic state. Honker and Grapevine lakes changed from eutrophic to mesotrophic states.

Lakes in the Ambient Monitoring Program. The following is a discussion on individual lakes that have been monitored over several years by the DOW, often with the aid of other researchers. Analyses are based on the combined databases. The extent of these databases gives the trend assessments a high level of confidence.

Reformatory Lake. The DOW classified this lake in Oldham County as hypereutrophic in the 1984 305(b) report. Its aquatic life use was not supported because of severe hypolimnetic oxygen depletion and dissolved oxygen of less than 5 mg/l in the epilimnion. Subsequent investigations indicated that livestock operations in the watershed were the major source of nutrients that caused the degraded lake conditions.

Best management practices were implemented to reduce nutrient loading to the lake from these livestock operations with the help of the University of Kentucky Agricultural Extension Service. Monitoring of the lake in 1985 and 1986 showed that these practices brought about water quality improvements. Algal biomass had decreased, water clarity improved, dissolved oxygen remained above 5 mg/l in the epilimnion, and there was less severe oxygen depletion in the hypolimnion. Total phosphorus, the nutrient of concern, had decreased.

Subsequent monitoring from 1987 through 1990 showed that there was a reversal in water quality. The lake was hypereutrophic in 1989 and again did not support aquatic life use. Site visits in the watershed in 1990 revealed that the best management practices had not been maintained and that nutrients from current livestock operations increased the phosphorus loading to the lake.

Livestock operations ceased in late 1990 due to economic factors. Monitoring in 1991 indicated an improvement in water quality. The lake was less eutrophic and dissolved oxygen in the epilimnion was greater than 5.0 mg/l. Hypolimnetic oxygen depletion was still severe with dissolved oxygen less than 1 mg/l. The lake was moved from the not supporting category to partially supporting in this report because of the improved water quality. Monitoring in 1992 and 1993 showed a continuing improvement in water clarity, a decreased eutrophic state, and a decline in phosphorus. Hypolimnetic oxygen depletion was still severe enough to cause the lake to remain in the partial support of aquatic life use category.

McNeely Lake. McNeely Lake is a 51-acre impoundment in southeastern Jefferson County. It was the subject of a Clean Lakes Phase I Project in 1980-1982 which recommended diversion of package wastewater treatment effluents to lower the trophic state of the lake and reduce nuisance algal blooms and duckweed growth. Following the passage of a local bond issue to finance the diversion project, grass carp were introduced into the lake. The grass carp have successfully controlled the duckweed growth. The lake has been monitored each year during the growing season since the completion of the diversion project in December 1988. The diversion piped the effluent from four package wastewater treatment plants to a discharge point below the lake. The first five years of post-diversion monitoring data have shown some improvement in water quality when contrasted with up to six years of pre-diversion data. The lake is no longer hypereutrophic as it was in 1987 and 1988. Carlson TSI values (chlorophyll *a*) were 69, 64, 66, 66, and 62 for the growing season in 1989, 1990, 1991, 1992, and 1993 respectively, compared to 71 in 1987 and 74 in 1988. The average euphotic zone total phosphorus concentration in the spring decreased from 441 ug/l before diversion to 70 ug/l after diversion, an 84 percent reduction. Average maximum total phosphorus concentrations in bottom water showed a 60 percent reduction (from 3,540 ug/l to 1,420 ug/l). The lake is still categorized as partially supporting aquatic life use because hypolimnetic oxygen depletion is severe and epilimnetic dissolved oxygen decreases to less than 5.0 mg/l in the late summer. There is still an ample supply of phosphorus to support eutrophic conditions in the lake. Evidence from studies of sediment cores indicate that the lake was eutrophic before development occurred in the watershed. Some lower level of eutrophy may be all that can be expected of a lake of this nature.

Lake Jericho. Lake Jericho is a 137-acre lake in Henry County formed by a dam on the Little Kentucky River. It was first monitored by the DOW in 1983. At that time, the lake was eutrophic, had a mean TSI of 57, and fully supported the aquatic life use. The lake was monitored again in 1989. Its TSI was 64, placing it in the eutrophic state. In September, dissolved oxygen dropped below 3.0 mg/l in the epilimnion and below 1 mg/l in the hypolimnion. These low dissolved oxygen values caused the lake to be categorized as not supporting the aquatic life use. The DOW continued to monitor the lake after 1989. In September of 1990 and 1991, low dissolved oxygen concentrations developed similar to those found in 1989. The lake was again categorized as not supporting aquatic life in the 1992 305(b) report. Data collected in 1992 showed the lake to be eutrophic (TSI of 63) in the growing season and to have some degree of hypereutrophy in midsummer. The lake did not exhibit low dissolved oxygen concentrations in the epilimnion. The hypolimnion continued to have oxygen concentrations of less than 1 mg/l at depths below 10 feet. Therefore, it was placed on the list of lakes partially supporting aquatic life use in this report. The land use in the lake's watershed is largely agriculture (80%), and this activity is suspected to be the source of nutrients that cause the lake to be eutrophic.

Other Water Quality Studies

The DOW undertook two projects related to use impairments in the past three years. One project assessed suspended solids contributions to secondary contact recreation impairment. The other assessed fecal coliform bacteria concentrations in recreation areas of three lakes. The projects are described below.

Suspended Solids and Recreational Use Support

The DOW has used information on suspended solids and turbidity from several eastern Kentucky lakes to assess secondary contact recreation use support. This was based on the belief that turbid water (as measured by suspended solids) at certain levels makes lakes unattractive for the public to pursue recreational activities such as boating, water skiing, wading, and aesthetic enjoyment. In order to assess this more objectively, measurements of suspended solids, turbidity, and light penetration were taken from Dewey, Fishtrap, and Martins Fork lakes on a monthly basis from March through October for one year. The data were used to quantify the turbidity levels in the lakes and to eventually develop criteria to evaluate use support. The results indicated that Dewey Lake was the most turbid, with a maximum suspended solids concentration of 54 mg/l at a midlake station in April. In contrast, the maximum concentration at Fishtrap Lake was 22 mg/l at an upper lake station from a May sample. Martins Fork Lake was very clear at all sampling dates and never exceeded a suspended solids concentration of 4 mg/l. Based on these results, Fishtrap and Martins Fork lakes were assessed as fully supporting the secondary contact use and Dewey Lake remained in the partially support category.

Fecal Coliform Bacteria and Recreational Use Support

The DOW entered into a Memorandum of Agreement with the Big Sandy Area Development District to sample Fishtrap, Dewey, and Paintsville lakes to determine fecal coliform bacteria concentrations. The lakes were each sampled at three recreation areas on a weekly basis from May through October of 1993. The primary contact recreation use was assessed from these results by using the same criteria outlined in Chapter 1 for rivers and streams. All of the lakes fully supported the swimming use. The DOW is scheduling other lakes for this type of sampling in its lake monitoring program to more fully assess primary contact use support across the state.

CHAPTER 4

WATER QUALITY ASSESSMENT OF GROUNDWATER

WATER QUALITY ASSESSMENT OF GROUNDWATER

Introduction

Kentucky's groundwater program continued to make progress in the areas of information acquisition and dissemination, research on groundwater quality and quantity, and groundwater use and protection regulation. The Kentucky Geological Survey is the designated state groundwater data repository. Contributors include the Division of Water (DOW), the Division of Waste Management, the U. S. Geological Survey (USGS), and many other regulatory and research- oriented agencies, organizations, and individuals throughout the state. The centralization allows for more efficient information dissemination as well as more standardized reporting methods.

Several new groundwater studies have been funded in the last two years. Research topics include nonpoint source pollution assessments, the effects of agricultural practices on groundwater quality, educational programs, karst feature mapping, and water resource planning and management techniques.

Kentucky has proposed groundwater regulations designed to prevent groundwater pollution. Kentucky's Wellhead Protection Program received EPA approval in September, 1993, and the Superfund program was updated with the establishment of release and cleanup reporting requirements and funding to make it more effective in 1992. Both the Wellhead and Superfund programs will help protect Kentucky's groundwater resources against future pollution.

Findings of Major Studies

Ongoing efforts in groundwater education and research in Kentucky are shown in Tables 4-1 and 4-2. Table 4-1 summarizes research funded by nonpoint source Section 319 grants, and Table 4-2 summarizes other studies. Each study monitors some aspect of groundwater quality or quantity. In addition, many of the studies monitor changes brought about by implementing best management practices (BMPs) in agriculture operations. When completed, the studies will contribute significant water quality data for several critical areas of Kentucky. Table 4-3 shows those studies completed within the last two years. A display of the karst study is located at the American Museum of Caves in Horse Cave, Kentucky. The display will be viewed by many students and other Kentuckians who tour the museum every year.

A public water supply spring study was conducted to evaluate the impacts of non-point source pollution on karst groundwater systems. Pesticides of both agricultural and urban use were detected at five of the springs at least once during the 18-month study period. The two springs with the most detections both had extensive agriculture throughout their drainage basins. Atrazine was the most commonly detected pesticide. All springs showed high turbidity under high flow conditions.

Table 4-1
Ongoing Groundwater Projects Funded by Federal Nonpoint Source Section 319 Grants

Organization	Hydrologic System	Description	Status
American Cave and Karst Center	Karst	Interpretive program for public schools and teacher workshops on karst and groundwater	Starting
Division of Water (NPS Branch) and Division of Conservation	Mammoth Cave	Monitor surface water in karst and cave area in relation to agricultural BMPs	In Progress
Division of Water	Groundwater	Development of urban runoff education program	In Progress
Division of Water (Groundwater Branch)	Turnhole Spring/Echo River groundwater basin	Mapping and tracing of karst features draining a major transportation corridor crossing the basin	Starting
Division of Water (Groundwater Branch)	Waterworks Spring groundwater basin	Mammoth Cave Demonstration Project - Waterworks Spring basin study	Starting
Jessamine County Conservation District	Karst aquifers	Pilot project to demonstrate protection of critical karst aquifer recharge areas (sinkholes)	Starting
Kentucky Geological Survey	Spring system	Monitor Pleasant Grove Spring drainage basin for nonpoint source pollution	In Progress
Kentucky State University (U.K. College of Agriculture)	Groundwater Basins	Investigate subsurface leaching potential of animal waste holding ponds	Starting

Table 4-1 (Continued)

Organization	Hydrologic System	Description	Status
University of Kentucky (College of Agriculture)	Groundwater	Farm and homestead environmental impact assessment	Starting
University of Kentucky (College of Agriculture)	Mammoth Cave area	Research, demonstration, and education programs on agricultural BMP effects on groundwater	In Progress
University of Kentucky (College of Agriculture)	Wetlands, cave ecosystems, and riparian habitats	The importance of wetlands, cave ecosystems, and riparian habitats in reducing nonpoint source pollution	Starting
University of Kentucky (College of Agriculture)	Groundwater basins	Study of maximum daily and annual nutrient and pesticide loads from turfgrass management areas	Starting
Warren County Conservation District	Spring systems	Monitor Harris Spring groundwater basin for agricultural practices and storm runoff sedimentation	In Progress
Western Kentucky University	Mammoth Cave	Assessment of constructed wetlands for animal waste management, monitoring, and demonstration trials	Starting

Table 4-2
Other Ongoing Groundwater Research, 1992-1993

Research Agency	Hydrologic System	Description	Status
Kentucky Geological Survey	Aquifers	Study effects of abandoned mine lands on water quality	In Progress
Kentucky Geological Survey	Aquifers	Study effects of deep coal mines on hydrogeology, Eastern Kentucky Coal Field	In Progress
Kentucky Geological Survey	Aquifers	Study groundwater geochemistry and its relationship to groundwater flow in Eastern Kentucky Coal Field	In Progress
Kentucky Geological Survey	Knox group	Study production of fresh water from the Knox Group	In Progress
Kentucky Geological Survey	Riparian habitats, Groundwater basins	Study riparian vegetation effects on water quality using models and experiments	In Progress
Kentucky Geological Survey	Surface Mine Spoil	Star Fire Mine: Monitor mine spoil to determine water quality	In Progress
Kentucky Geological Survey	Groundwater Basin	Monitor Robinson Forest groundwater basin before and during coal mining activities	In Progress
Kentucky Geological Survey	Kentucky River Basin	Study of groundwater resources within the Kentucky River Basin	Starting

Table 4-2 (Continued)

Research Agency	Hydrologic System	Description	Status
Kentucky Geological Survey	Kentucky River Basin	Water resources planning and management in the Kentucky River Basin	Starting
Kentucky Geological Survey	All Groundwater	Groundwater data repository for the state (including KGS KARD-Kentucky Aquifer Research Database)	Starting
Kentucky Geological Survey (UK College of Agriculture)	Spring System	Study hydrogeology of Garretts' Spring (Sinking Creek) Drainage Basin	In Progress
Kentucky Geological Survey (UK College of Agriculture)	Drainage basin	Study hydrology of a drainage basin in relation to agricultural practices in Hickman County	In Progress
Kentucky Geological Survey (U.K. College of Agriculture)	Groundwater basins	Study effects of various crop types/till methods on groundwater quality in Hopkins, Daviess, Fleming, Russell, and Shelby counties.	Starting
Kentucky State University	Groundwater basin	Describe and assess impacts and processes associated with agricultural practices	In Progress
University of Kentucky (College of Agriculture)	Groundwater basins	Study agricultural chemical use impacts on groundwater resources in selected sites in Kentucky	In Progress
University of Kentucky	Groundwater basin	Study effects of land-use on water quality at 4 watersheds in Elizabethtown, Kentucky	In Progress

Table 4-2 (Continued)

Research Agency	Hydrologic System	Description	Status
United States Geological Survey	Spring systems	Monitor water quality and low flow characteristics of 3 public water supply springs, Elizabethtown, Kentucky	In Progress
United States Geological Survey	Vadose zone	Study hydrogeology of the vadose zone and define the fate and transport of agricultural chemicals	In Progress

Table 4-3
Groundwater Projects Completed in 1992-1993

Agency	Hydrologic System	Description
Division of Water (319 Nonpoint Source Program)	Karst areas	Groundwater exhibit to be displayed in the American Museum of Caves, Horse Cave, Kentucky
Division of Water (Groundwater Branch) (Nonpoint Source Program)	Spring systems	Monitor 7 public water supply springs for nonpoint source pollution

Issues of Concern

For the past two years, the DOW's Groundwater Branch has been developing a regulation to protect groundwater. The proposed regulation originally included groundwater quality standards and groundwater classification. Public comment indicated the regulations were not acceptable. A consensus group was formed that included representatives of industry, agriculture, and environmental groups. New proposed regulations were developed through a negotiated rule-making process. The new proposed regulations require facilities that may impact groundwater to develop and implement groundwater protection plans. The proposed regulations were presented to the Administrative Regulation Review Subcommittee in the fall of 1993. This committee did not approve the regulations and they were withdrawn by the Cabinet. Negotiations are currently being conducted to resolve perceived problems.

A key issue during the groundwater regulation development was the lack of background groundwater quality data. Although some local studies have been conducted, there is no comprehensive assessment of natural groundwater quality for most of the state. Thus, anthropogenic degradation of groundwater quality is difficult to document. Kentucky must secure financial resources to implement an ambient groundwater quality monitoring network.

Another important concern is the vulnerability of Kentucky's groundwater to pollution. At least half of Kentucky's aquifer systems occur in karst regions. These aquifers are highly susceptible to contamination from the surface. The karst regions are considered to be prime agricultural regions and also include several cities. An assessment of the relationship between the location and vulnerability of an aquifer is of the utmost importance to the future of groundwater protection in karst systems.

Progress in Groundwater Protection Programs

EPA approved Kentucky's Wellhead Protection Program in September, 1993. The program is coordinated by the DOW's Groundwater Branch and is regulated through the Water Supply Planning Regulations (401 KAR 4:220). These regulations require that every public water system using groundwater have a community wellhead protection plan approved by the DOW by 1998. There are currently 410 public water supply systems using groundwater; 65 (16%) are in the process of implementing the Kentucky wellhead protection regulations, and 25 of those (39% of those systems in the process of implementation) have fulfilled all the basic steps and have only to plan for future protection as the final step. The total population affected by these 65 wells is 55,136, while the population of those systems being actively protected is 9,326.

The Kentucky Superfund program was created in 1980, but was inadequately funded. In 1990, the funding was increased, and in 1992 the program was "revitalized" with the Kentucky General Assembly's passage of House Bill 540. In the year since enactment of the legislation, the program has developed an on-line tracking and inventory system, commenced preparation of Cabinet-wide technical guidance documents on site characterization, drafted a risk management issues paper, drafted a site ranking and priority instrument; and started monitoring sites in Kentucky. As of December, 1993, there were 52 sites in remediation, seven sites in post-closure monitoring, 12 sites on the state priority list for funding, and 212 sites under state investigation. Remediation has been completed on 133 sites since 1992.

The Drillers Certification Program requires water well and monitoring well drillers to be certified by the DOW and establishes minimum well construction criteria to protect human health and the environment. Table 4-4 presents the total number of certified drillers, and number of permitted rig operators, and breaks down the number of drillers certified for water wells only, monitoring wells only, and both water and monitoring wells. A Certified Driller is required to carry liability insurance and to be bonded; a rig operator works under the bond and insurance of a Certified Driller.

Table 4-4
Well Driller Certification and Rig Operator Permits

Year	Certified Water Well Drillers	Certified Monitoring Well Drillers	Certified for Both	Total Number of Certified Drillers	Permitted Rig Operators
1991	34	121	132	**287**	190
1992	77	62	60	**199**	264
1993	60	82	63	**205**	287

The total number of Certified Drillers has decreased over the past two years, while during the same time the number of rig operators has increased. This is because many companies are changing to one Certified Driller with several rig operators under a single insurance policy and bond, thus reducing expenses.

Assessment of Groundwater Quality

Sources of groundwater contamination in Kentucky (Table 4-5) are generally not well documented. Two of the sources (injection wells and underground storage tanks) are limited by regulations to such an extent that they will not be major sources of groundwater pollution. Major contaminants from those sources listed in Table 4-5 are shown in Table 4-6. Again, little information is available on the amount, frequency, or proximity to populations of the materials being released.

Table 4-5
Potential Major Sources of Groundwater Contamination

Animal Feedlots	Pipelines and Sewer Lines
Containers	Radioactive Disposal Sites
Deep Injection Wells	Saltwater Intrusion
De-icing Salt Storage Pits	Septic Tanks
Fertilizer Applications	Shallow Injection Wells
Irrigation Practices (return flow)	Storage Tanks (above ground)
Land Application	Storage Tanks (below ground)
Landfills (permitted)	Stormwater Drainage Wells
Landfills (unpermitted)	Surface Impoundments
Material Transfer Operations	Transportation of Materials
Mine Drainage	Urban Runoff
Pesticide Applications	Waste Tailings
	Waste Piles

Environmental Indicators

Many bits of data can indicate the condition of groundwater over a period of time. In addition to those indicators requested by this report, Kentucky monitors several other indicators. Some of these are holdovers from older requests by this report (e.g., the RCRA and Superfund site contaminations). Others (e.g., underground storage tanks and groundwater withdrawal) are indicators that Kentucky is using to evaluate groundwater condition and trends.

Table 4-6
Ground Water Contaminants

Organic Contaminants	Inorganic Contaminants
Pesticides	Pesticides
Other agricultural chemicals	Other agricultural chemicals
Petroleum compounds	Nitrate
Other Organic Chemicals:	Fluorides
Volatile	Brine/Salinity
Semi-volatile	Metals:
Miscellaneous	Arsenic
	Other metals
Microbial Contaminants	Radionuclides
Bacteria	
Protozoa	
Viruses	

Public Water Systems with Contamination

The Safe Drinking Water Act and Kentucky's Drinking Water Regulations require Public Water Systems (PWSs) to test regularly for contaminants. The testing schedule for those systems that have exceeded Maximum Contaminant Levels (MCLs) is increased until the contaminant level is less than the EPA standard. Those systems with contamination exceeding MCLs are shown in Table 4-7. The breakdown of which contaminant groups caused problems is shown in Table 4-8.

Sampling in 1992 and 1993 showed that three contaminants in both 1992 and 1993 were greater than 50% of, but did not exceed, the MCLs. In 1992, barium, lead, and selenium were detected, while cadmium, nitrate, and trichloroethylene were detected in 1993 (Table 4-9).

Table 4-7
Number of MCL Exceedances for Groundwater-Based or Partial Groundwater-Supplied Community PWSs for Selected Contaminants in Four Contaminant Groups

	Groundwater-Based or Partial Groundwater-Supplied Community PWSs		Groundwater-Based or Partial Groundwater-Supplied Community PWSs with MCL Exceedences	
Year	1992	1993	1992	1993
Total No.	156	165	6	3
Population Served	Not Available	497,130	32,410	3,610

Table 4-8
Number of Groundwater Supported Public Water Supplies (PWS) with MCL* Violations

Contaminant Group	Number PWS with MCL Violations 1992	1993
Metals		0
Barium	2	
Lead	4	
Nitrate	0	2
Pesticides	0	0
Regulated Volatile	0	
Trichloroethylene		3
Bacteria	4	4
Population at Risk	**32,410**	**3,610**

*MCL = Maximum Contaminant Level

Table 4-9
Public Water Systems (PWS) with Contaminants between 50% and 100% of MCLs

Contaminant Group	Number of Samples with Contaminants Between 50% and 100% / Number of Samples Analyzed 1992	1993
Metals		
Barium	2/24	
Cadmium		1/35
Lead	5/25	
Selenium	4/25	
Nitrate	0/24	14/210
Pesticides	0/5	0/19
Regulated Volatile Organic Compounds	0/88	
Trichloroethylene		3/58

Kentucky Wellhead Protection Program

The 1989 amendments to the Safe Drinking Water Act required every state to adopt a wellhead protection plan to protect public water supply wells and springs from contaminants. EPA approved Kentucky's Wellhead Protection Program in September, 1993. Kentucky is the thirtieth state with an approved Wellhead Protection Program and the fourth in EPA Region IV. Kentucky's Wellhead Protection Program is coordinated by the DOW's Groundwater Branch and is regulated through the Water Supply Planning Regulations (401 KAR 4:220). These regulations require that public water systems utilizing groundwater have a community wellhead protection plan approved by the DOW by 1998.

Wellhead protection is implemented at the local government level in a five step manner as follows: 1) form a community planning team; 2) delineate a wellhead protection area for each well or spring; 3) inventory potential sources of contamination within the wellhead protection area(s); 4) develop management strategies to control potential source contaminants; and 5) plan for the future. Those public water systems already participating in the program are listed in Table 4-10 together with a step number indicating the progress in groundwater protection.

Table 4-11 depicts the total number of PWSs with wellhead protection programs in place versus the total number of community systems using groundwater. The main reason that PWSs with wellhead protection serve a small population is because these PWSs are small, need less sophisticated protection methods, and can therefore implement their plans faster.

The Kentucky Rural Water Association (KRWA) is one of 14 rural water associations in the nation that operates a wellhead protection program to help small communities develop wellhead protection plans. EPA grants awarded to KRWA provided wellhead protection training seminars held in four different locations across the state between February and March 1994. The seminars were designed to educate local government officials, community planners, and public water supply operators on several aspects of groundwater protection and current groundwater regulations.

Table 4-10
Wellhead Protection Programs

Region	Step 1	Step 2	Step 3	Step 4	Step 5	Number of Systems	Population Protected	Percent of Population Protected
Bluegrass	3		1	2		6	8,005	14.62
Eastern Coal Field	4	3	11	9		27	4,851	9.03
Western Coal Field				1		1	1,492	14.26
Mississippian Plateaus		1	4	1		6	155	0.08
Ohio River Alluvium	3	1	6	6	1	17	22,396	17.81
Jackson Purchase	2		2	3		7	18,237	16.93
Number of Systems	12	5	24	24	1			
Population Protected	11,460	3,383	30,967	7,033	2,293			
Totals						**64**	**55,136**	**10.11**

Table 4-11
Number of Groundwater-based or Partial Groundwater-supplied Community PWSs that Have Local Wellhead Protection Programs (WHPPs) in Place

Number of Groundwater Supplied Community Systems	Population Served	Number of Groundwater Supplied Community PWSs with WHPPs in Place	Population Served
165	497,130	25	9,326

RCRA Site Contamination

Contaminants reported from Subtitle C facilities are listed in Table 4-12. Contaminated sites listed in the 1992 305(b) report are also shown to indicate trends. There are twelve more total sites and two additional sites with off-site contamination for the present reporting period.

Contaminants reported from Subtitle D facilities are listed in Table 4-13. Again, contaminated sites listed in the 1992 report are included for comparison. Since the last report, information on off-site contamination has become available for RCRA-D sites. Overall, three fewer sites are listed for this reporting period.

Table 4-12
RCRA Subtitle C Hazardous Waste Site Groundwater Contaminants

Contaminant Group[1]	# of Sites with On-Site Contamination[2]		# of Sites with Off-Site Contamination[3]	
	1991	1993	1991	1993
Metals	21	19	4	8
Volatile Organics	28	35	6	4
Semi-volatile Organics	4	8	1	4
PCBs	1	1	1	0
Pesticides	2	1	0	0

[1]Most sites are impacted by more than one contaminant group.
[2]Total Number of sites with On-site contamination = 28-1991, 40-1993
[3]Total Number of sites with Off-site contamination = 10-1991, 11-1993

Table 4-13
RCRA Subtitle D Solid Waste (Landfill) Sites

Contaminant Group	# with On-Site Contamination		# with Off-Site Contamination	
	1991	1993	1991	1993
Metals	16	18	-	1
Organics	17	10	-	1
Radionucleides	-	2	-	1
Pesticides	Those landfills that ran this analysis did not show contamination above MCLs			
PCBs	Those landfills that ran this analysis did not show contamination above MCLs			

Superfund Site Contamination

The Kentucky General Assembly passed House Bill 540 in the 1992 regular session. This law established release reporting and cleanup requirements for Kentucky. An implementation workgroup was established in March, 1992 consisting of staff from the divisions of Waste Management, Water, Air Quality, and Environmental Services. This workgroup identified and prioritized issues that had to be addressed for successful implementation of the statute. The high priority issues consist of: (1) tracking/inventory, reporting requirements, and Five-Year Reviews; (2) characterization and cleanup requirements; (3) risk assessment/risk management; and (4) ranking and prioritization.

A computer-based tracking and inventory system became operational on June 1, 1993. Data for all sites received from January 1, 1990 to June 1, 1993 have been entered to facilitate identification of sites requiring five-year reviews.

Cabinet-wide technical guidance documents on characterization are being prepared by a cross-divisional workgroup. A draft is expected to be released for public comment in 1994.

The Cabinet has drafted a risk assessment guideline that is intended to standardize data collection, analysis, and format. The Cabinet also developed a risk management issues paper that was released for public comment. This paper proposes a negotiated rule-making process for development of the final risk management regulations.

A ranking and priority instrument was developed by the Cabinet. It is scheduled for release for public comment in early 1994. The instrument rates several aspects of a site including environmental contamination (what pathways are affected and to what extent), mobility, sensitive environments, population, and waste characteristics.

Currently, there are 1,016 sites reported to the State Superfund program. The Superfund Branch is working on funding for the 20 top priority sites.

Table 4-14 lists federal superfund sites being monitored by EPA. Two years ago, only sites administered by EPA were reported. Some sites previously administered by EPA are currently administered by the Kentucky Superfund Branch of the Division of Waste Management. Both EPA and the Superfund Branch will continue to be active in the state.

Table 4-14
Federal Superfund Site Groundwater Contaminants (1994)

Sites With Contamination:	1991	1993
On-Site	72	18*
Off-Site	14	7
Affecting Public Water Supplies	1	1

* Change in primacy from EPA to Kentucky is the reason for the large drop in number of sites between 1991 and 1993.

Underground Storage Tanks

The Underground Storage Tank Regulation Program has been in effect since 1984. As of the end of 1993, 38,573 tanks have been registered with the Division of Waste Management's Underground Storage Tank (UST) Branch. Table 4-15 shows the number of tanks occurring in each physiographic region and the number that are known to be leaking. Many more tanks are still not registered across Kentucky. These tanks represent a potentially large amount of contaminants that may be polluting groundwater. The UST Branch is working on this backlog as time and staffing allow.

Table 4-15
Underground Storage Tanks in Kentucky (by physiographic region)

Region	Number of Tanks Registered	Number of Registered Tanks Leaking
Bluegrass	15,811	172
East Coal Field	8,324	61
West Coal Field	3,686	15
Mississippian Plateau	8,739	47
Ohio River Alluvium	*	93
Jackson Purchase	2,013	9
Totals	**38,573**	**397**

* Underground Storage Tank data did not allow for segregation of this information; tanks in this area were distributed throughout the other regions.

Groundwater Withdrawal

The amount of groundwater removed during any one year may be impossible to assess, but an estimate of a minimum amount can be made. Records of groundwater withdrawal have been kept since 1980 by the Water Withdrawal Section of the DOW's Water Resources Branch. These records reflect only those groundwater users who have been permitted by the DOW to withdraw more than 10,000 gallons of water per day. Permittees include PWSs (both community and noncommunity, and public and semipublic), hospitals, state parks, golf courses and country clubs, industrial and commercial facilities, and mining operations. There has been a steady increase in permitted PWSs since the beginning of record keeping in 1980 (see Table 4-16). Information on the other withdrawal types has only recently been made available. The total average withdrawal from all types of permitted withdrawers in 1992 is approximately 56.6 billion gallons per year. In 1991, the total average was approximately 52.0 billion gallons per year. An additional 1.8 billion gallons per year can be added to each of those totals as the amount of water withdrawn by private well owners (Environmental Quality Commission 1992) to bring the totals to 58.4 and 53.8 billion gallons for 1992 and 1991, respectively.

The amount of water withdrawn by PWSs, coal mines, and industries that use less than 10,000 gallons per day is unknown at this time. No mechanism for reporting or assessing this information is currently available. In the case of PWSs, this could amount to a large addition to the total average as approximately 300 PWSs fall into this category. These smaller PWSs may be assessed in the near future, but the other categories will likely remain unknown for years to come. In addition, the farming industry and electrical generating plants in Kentucky are exempt from water permitting and withdraw an unknown quantity of water each year.

Table 4-16
Average Annual Ground Water Withdrawal by Type
(In millions of gallons per day)

Year	Drinking Water[1]	Commercial[2]	Coal Mining
1980	37.8	Information on these groundwater users not available for the years 1980 through 1991.	
1981	38.8		
1982	38.8		
1983	46.8		
1984	43.8		
1985	43.8		
1986	49.8		
1987	44.8		
1988	46.8		
1989	49.8		
1990	52.8		
1991	55.8		
1992	57.7	92.7	4.4

[1] Includes those community Public Water Systems (PWS) that are permitted to withdraw more than 10,000 gallons of groundwater per day. It also includes those semipublic/non-community Public Water Systems such as hospitals, schools, golf courses/country clubs, and Kentucky State Parks permitted for withdrawal of more than 10,000 gallons of groundwater per day.

[2] Includes all companies/industries that sell products and that are permitted for withdrawal of more than 10,000 gallons of groundwater per day.

CHAPTER 5

WATER POLLUTION CONTROL PROGRAMS

WATER POLLUTION CONTROL PROGRAMS

Point Source Control Program

Wastewater Treatment Facility Permitting

Point source pollution refers to any discharge from municipal or industrial facilities that can be identified as emanating from a discrete source such as a conduit or ditch. Kentucky has a total of 3,066 active permits covered by the Kentucky Pollutant Discharge Elimination System (KPDES) program. More than 4,700 additional coal mining-related discharges are covered under the KPDES Coal General Permit. Starting with the October 1992 EPA deadline for certain existing industrial stormwater sources, Kentucky has covered more than 1,600 facilities under eight new General Permits to date. EPA deadlines also required stormwater permit applications from two Kentucky metropolitan areas (Louisville and Lexington). The permits issued by the state for these areas mandate comprehensive pollution prevention planning programs augmented by system-wide stormwater monitoring.

The overflow from combined sanitary and stormwater sewers in excess of the interceptor sewer or regulatory capacity that is discharged into a receiving water without going to a publicly owned treatment works (POTW) is considered a combined sewer overflow (CSO). There are currently 341 CSO points statewide from 27 separate systems. Most of these are located on larger streams such as the Ohio River and Kentucky River. The state began to include permit language addressing CSOs in the summer of 1991 as permits expired and were reissued. Currently, eight permittees have permits reissued with CSO language included, and these eight permits cover 169 of the identified CSO points.

Section 104(b)(3) grants have been awarded to the Kentucky Division of Water (DOW) for CSO studies by the Metropolitan Sewer District in Louisville - Jefferson County and by the University of Kentucky's Water Resources Research Institute in the Northern Kentucky area. Water quality data specifically related to CSO events are being collected to determine the role of CSOs in water quality problems in the study area. This information, currently under review, will be valuable in developing a statewide database for tracking CSO trends and should facilitate future permitting and implementation strategies.

Wastewater permit limits in Kentucky have been water quality based since National Pollutant Discharge Elimination System (NPDES) program delegation on September 30, 1983. Generally, there are two approaches for establishing water quality-based limits for toxic pollutants: (1) chemical-specific limits, which are based on individual chemical criteria for all known toxic or suspected toxic pollutants in an effluent; and (2) whole effluent toxicity (WET) testing, which sets limits on an effluent's total toxicity as measured by acute or chronic bioassays on appropriate aquatic organisms. Both approaches have advantages and drawbacks, but when both are integrated into a toxics control strategy, they provide a flexible and effective control for the discharge of toxic pollutants.

Effluent Toxicity Testing

Toxicity data are available for only a limited number of compounds. Single parameter criteria often do not adequately protect aquatic life if the toxicity of the components in the effluent is unknown, there are synergistic (greater than predicted) or antagonistic (less than predicted) effects between toxic substances in complex effluents, or a complete chemical characterization of the effluent has not been carried out. Since it is not economically feasible to conduct exhaustive chemical analysis or determine the toxicity of each potentially toxic substance, the most direct and cost-effective approach to measuring the toxicity of complex effluents is to conduct whole effluent toxicity tests with aquatic organisms.

The DOW adopted an integrated strategy in 1988 to control toxic discharges into surface waters that included both chemical-specific limits and WET limits on certain KPDES permits. These limits were applied to most major and selected minor discharges with an approved pretreatment program. The WET limitations were developed for both acute and chronic levels based on a case-by-case evaluation of the discharge type and volume and the size of the receiving stream. WET is a useful complement to chemical-specific limits because it directly measures toxicity to aquatic organisms. It takes into account the aggregate toxicity in complex effluents and the chemical and physical interactions occurring in the effluent.

The DOW has implemented the WET limit into KPDES permits as a toxicity unit (TU). The TU allows acute and chronic toxicity to be reported numerically in the permit and on a discharge monitoring report (DMR) in order to determine compliance. Toxicity tests are conducted on a monthly basis for the first year of biomonitoring and quarterly in subsequent years. Test species are water fleas *(Ceriodaphnia dubia)* and fathead minnow *(Pimephales promelas)*. Acute tests are 48-hour static exposures. Chronic tests are the 7-day *P. promelas* growth test and the 7-day *C. dubia* reproduction test. Non-compliance with the acute toxicity limit is demonstrated if the LC50 (that concentration which causes 50% mortality in the test organisms) is less than the permit limit concentration. Non-compliance with the chronic limit is demonstrated if the IC25 (that concentration which causes a 25% reduction in growth or reproduction) is less than the permit concentration. Prior to 1993, compliance with a chronic limit had been based on a no observable effect level (NOEL).

During 1992 and 1993, toxicity tests were performed by the DOW at 38 municipal and 11 industrial wastewater facilities. Results of these tests indicated acute toxicity at 19 locations (39%) and chronic toxicity at 7 (14%) (Table 5-1). These effluent tests, in addition to several instream toxicity tests conducted on samples upstream and downstream of discharges, indicated potential impacts to portions of receiving streams in eight river basins.

The DOW has placed toxicity limits on 79 municipal and 40 industrial treatment facilities. Figure 5-1 and Table 5-2 show a breakdown of these 119 permits by facility type and toxicity limit.

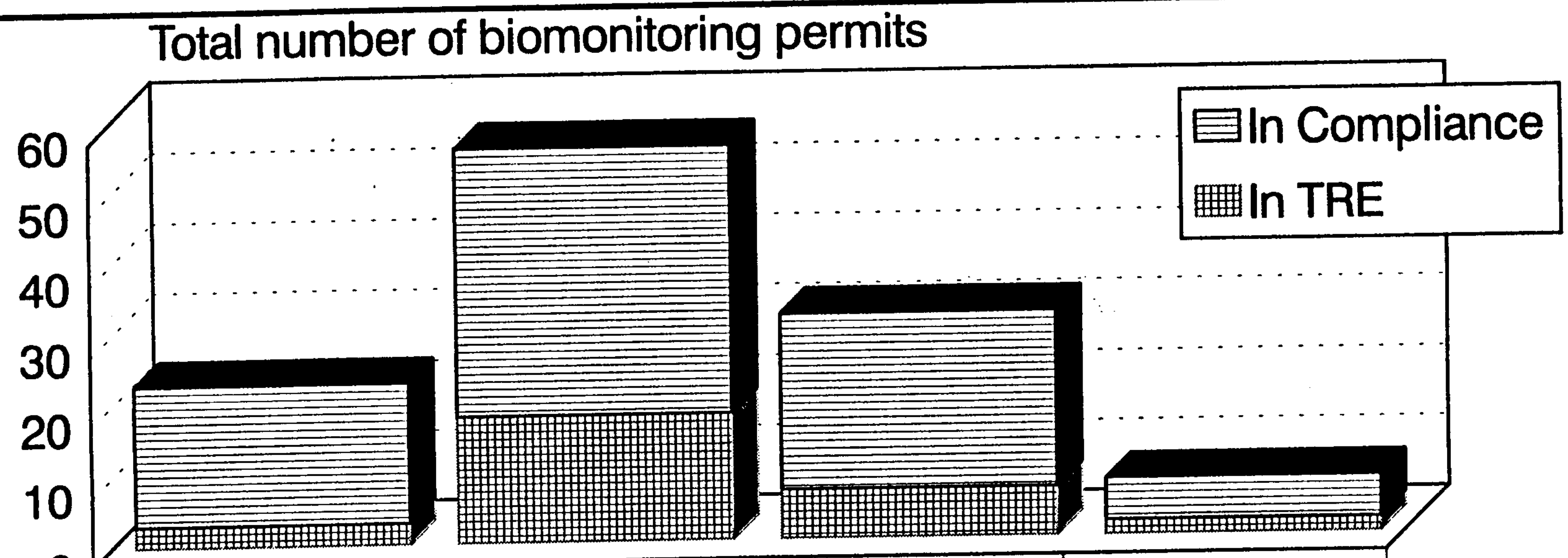
Table 5-1
Division of Water Effluent Toxicity Testing
1992-1993

FACILITY	TOXIC SITES	TOTAL TESTS	PERCENT TOXIC
	1992		
MUNICIPAL:			
MAJOR*	10	12	83
MINOR WITH PRETREATMENT**	0	1	0
MINOR***	2	6	33
TOTAL	12	19	63
INDUSTRIAL	1	5	20
	1993		
MUNICIPAL:			
MAJOR	9	13	69
MINOR/PRETREATMENT	1	6	17
MINOR	0	0	NA
TOTAL	10	19	53
INDUSTRIAL	2	6	33

*At least one million gallons a day
**Less than one million gallons a day and with a pretreatment program
***Less than one million gallons a day and with no pretreatment program

Figure 5-1: NUMBER OF BIOMONITORING PERMITS

BY FACILITY & PERMIT TYPE



	Municipal, Acute	Municipal, Chronic	Industrial, Acute	Industrial, Chronic
% Compliance	13	32	21	25
In Compliance	20	38	25	6
In TRE	3	18	7	2

Year-end 1993

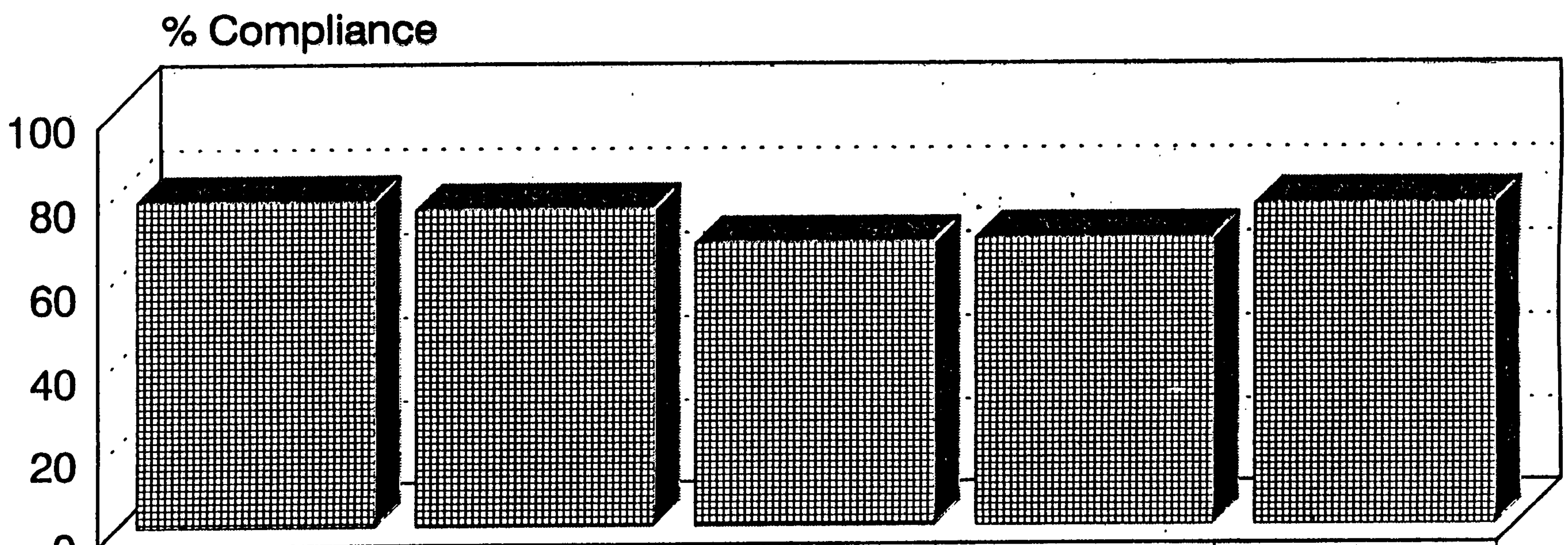
During 1992 and 1993, a total of 1731 tests were conducted by these facilities in accordance with KPDES biomonitoring permit requirements. The results showed 89 facilities (75%) met their toxicity limit (Table 5-2). Those not in compliance are conducting a toxicity reduction evaluation (TRE). The TRE is a step-wise process in which the operation of the facility is first evaluated and optimized. The effluent is then fractionated, if necessary, to determine what constituents are contributing to the toxicity and efforts made to eliminate these agents through source reduction or treatment optimization. Figure 5-2 shows the percentage of facilities in compliance since 1988. The percent compliance has remained relatively constant, ranging from 68% to 78% since the program started in 1988. However, as the number of KPDES permits with biomonitoring has increased over the years, the number of resolved TREs has also increased (Figure 5-3).

Table 5-2
Summary of Biomonitoring-Permitted Facilities at the End of 1993

	FACILITIES	TREs	% COMPLIANCE
INDUSTRIAL			
ACUTE	32	7	78.1
CHRONIC	8	2	75.0
MUNICIPAL			
ACUTE	23	3	87.0
CHRONIC	56	18	67.9
TOTAL	119	30	74.8

Ten facilities had completed TREs by the end of 1992, and a total of 14 were finished by the end of 1993. Thirty facilities (of a total of 119 with toxicity limits) are currently conducting TREs. The time needed to complete a TRE has ranged from eight months to four years and seven months. There are three facilities that have been in a TRE for more than five years. These facilities have not been able to determine a cause of their chronic toxicity.

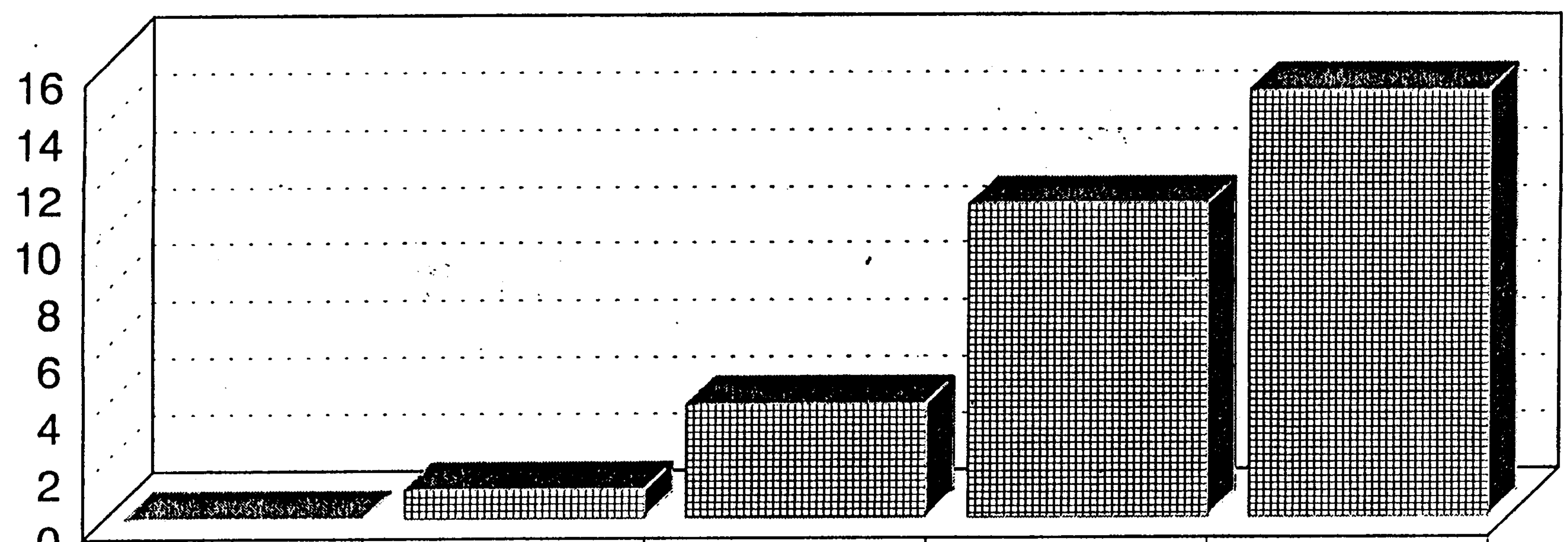
Figure 5-2: BIOMONITORING COMPLIANCE*
BY YEAR



	Before 1990	1990	1991	1992	1993
1992	78	76	68	69	77

*Percent compliance is defined as facilities not in a TRE.

Figure 5-3: NUMBER OF TREs COMPLETED
BY YEAR



	Before 1990	1990	1991	1992	1993
1992	0	1	4	11	15

Figure 5-3 shows the progression of successfully completed TREs since 1990. The reduction of toxic discharges is being achieved through new treatment plant construction, plant improvements, plant operational changes, identification of new treatment options, removal of toxic sources, and enforcement of pretreatment program requirements. Construction and expansions of treatment plants were initiated primarily to deal with loading and capacity problems, but have had the added benefit of increasing WET compliance.

A close examination of the facilities in TREs has revealed that treatment type can play a significant role in the degree of toxicity in a discharge. Figure 5-4 shows how treatment type affects compliance with the biomonitoring limit. Considerable (119%) improvement in the compliance of Rotating Biological Contactors (RBCs) treatment plants has occurred with additional treatment such as oxidation ditches, resulting in less reliance on the RBC treatment technology. Optimizing plant operation and maintenance has also proven to be an important factor in reducing toxicity.

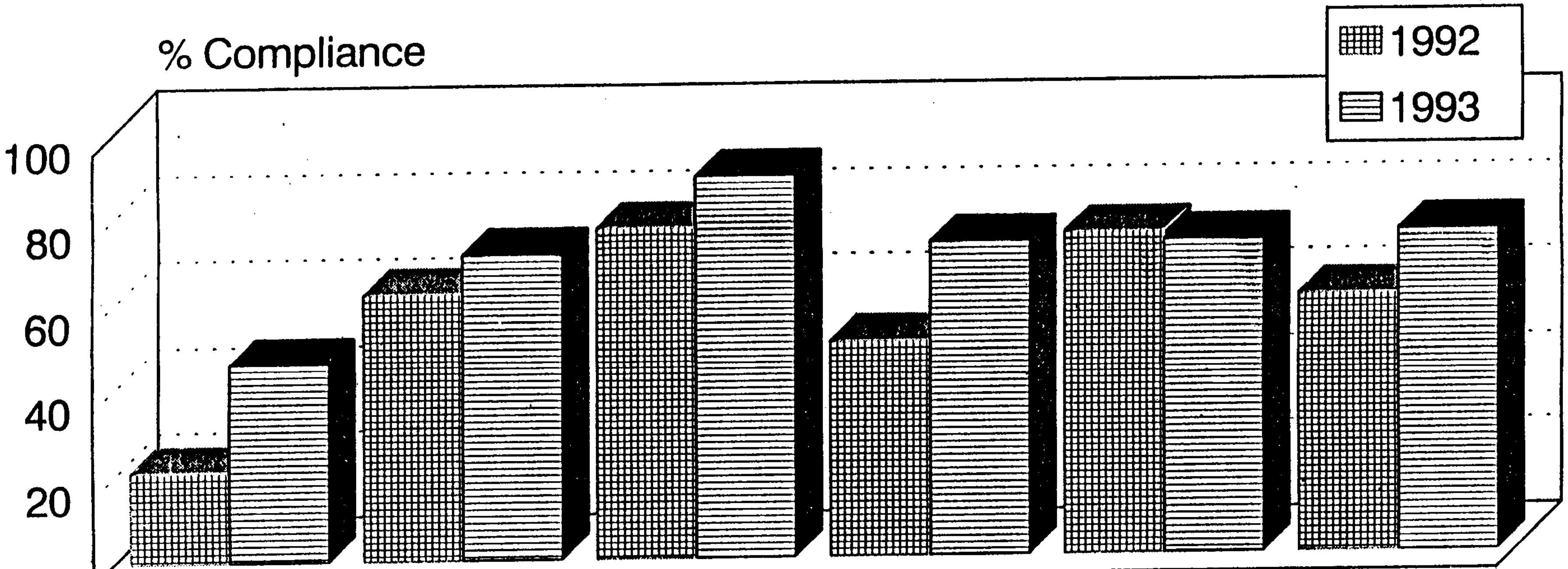
Toxicity identification evaluations (TIEs) have been performed on a number of facilities with varying success. The most commonly found groups of toxicants are metals and pesticides. It is becoming more apparent that the organophosphate insecticide Diazinon, commonly applied to lawns, turfs, and crops is a significant nonpoint source pollutant. There are a number of studies indicating that Diazinon levels reach or exceed the chronic and acute toxicity thresholds for aquatic organisms both in surface and groundwater (Table 5-3). Apparently, Diazinon is also a point source pollutant at some of Kentucky's KPDES-permitted municipal discharges. Based on limited data from TRE reports, Diazinon passes through wastewater treatment plants and enters receiving streams.

Table 5-3: Diazinon Ambient Data In Kentucky

Reference	Number of Detections	Number of Samples	Mean of Detections (ug/L)	95% Confidence Interval of Detections (ug/L)
Kentucky Division of Water 1992: Spring Data	4	126	0.18	0.04-0.20
STORET 1993: State of Kentucky	58	149	0.08	0.06-0.12
USGS 1992: Kentucky River	15	19	0.10	0.03-0.17

POTWs typically report more Diazinon-related toxicity during seasons of heavy pesticide use, i.e., April through September. Four facilities have confirmed that Diazinon contributes to their effluent toxicity by using the EPA Phase III TIE protocol (Mount & Anderson-Carnahan 1988). Other facilities have initiated daily monitoring of Diazinon levels in their effluents during 7-day chronic biomonitoring tests using a relatively inexpensive enzyme-linked immunosorbent assay kit (ELISA). Based on limited data, levels of Diazinon appear to correlate ($r=0.89$) with effluent toxicity and coincide with the pesticide application season, especially August and September.

Figure 5-4: BIOMONITORING & TREATMENT TYPE



	RBC	Activate Sludge	Ox. Ditch	Ext. Aeration	Trickling Filter	Lagoon
1992	21	62	77	50	75	60
1993	46	71	89	73	73	75

*Percent compliance is defined as facilities not in a TRE.

The 96-hour acute toxicity level of Diazinon to *Ceriodaphnia dubia*, the most commonly used biomonitoring species, is 0.2 ug/L. Approximately 34% of the daily samples analyzed for Diazinon exceeded this 96-hour acute toxicity threshold. A summary of Diazinon data associated with biomonitoring at seven POTWs is presented below in Table 5-4.

Table 5-4: Diazinon Discharge Data In Kentucky

Total Number of Samples	48-hr Acute Toxicity Level (ug/L)	Percent (%) Above 48-hr Level	96-hr Acute Toxicity Level (ug/L)	Percent (%) Above 96-hr Level	Mean (95% C.I.) (ug/L)
134	0.4	21	0.2	34	0.28 (0.21 - 0.36)

A number of questions remain unanswered related to Diazinon toxicity in Kentucky waterways and WWTPs. Issues for which data are being collected include: (1) the extent of the problem; (2) the persistence of this insecticide compared to other pesticides; (3) the reasons some facilities can effectively treat the pesticide and others cannot; (4) the current treatment efficiencies for Diazinon; (5) the mode of entry of Diazinon into the WWTP collection systems; and (6) the instream effects resulting from Diazinon discharges and runoff. The DOW continues to work with municipalities to determine the extent and sources of Diazinon entering waterways and collection systems and its role in toxicity.

Pretreatment Program

The quality of Kentucky's surface waters continues to face a threat from improperly treated industrial waste discharged into municipal sewage treatment systems. Such waste often contains pollutants that are either not removed by the municipal treatment process or, if removed, result in the generation of contaminated sludge. In an effort to control this problem, Kentucky has approved pretreatment programs in 71 cities (64 active, 7 inactive as of February 1994) and has screened several others to determine their need for a pretreatment program. During the period covered by this report, new programs have been approved and implemented in Morganfield, Shepherdsville, and Wurtland. A list of communities with approved pretreatment programs and the estimated costs to administer the local program is presented in Table 5-5. The facilities needing programs are all on schedule for obtaining approval. Once approved, each program is inspected annually and must submit semi-annual status reports to the DOW for review. These reports are incorporated into the computer files known as the Permit Compliance System (PCS) and Pretreatment Permits and Enforcement Tracking System (PPETS). Kentucky was recognized by U.S. EPA in 1991 and 1992 for achievements in its use of the PPETS program.

Table 5-5
Total Estimated Level of Annual Funding Required to Implement the POTW Pretreatment Program

No.	POTW	$/Year
1	Adairville	15,000
2	Ashland	90,844
3	Auburn	15,000
4	Bardstown	20,000
5	Beaver Dam	5,000
6	Berea	7,000
7	Bowling Green	52,200
8	Cadiz	INACTIVE
9	Calhoun	INACTIVE
10	Calvert City	5,000
11	Campbellsville	46,410
12	Campbell/Kenton SD #1 *	132,000 *
13	Caveland Sanitation	14,880
14	Corbin	68,046
15	Cynthiana	8,000
16	Danville	13,000
17	Edmonton	INACTIVE
18	Elizabethtown	350,000
19	Elkton	1,000
20	Eminence	22,500
21	Flemingsburg	9,000
22	Frankfort	40,000
23	Franklin	32,000
24	Fulton	18,000
25	Georgetown	12,000

Table 5-5 (Continued)

No.	POTW	$/Year
26	Glasgow	22,600
27	Guthrie	7,000
28	Harrodsburg	15,000
29	Hartford	6,260
30	Henderson	24,800
31	Hopkinsville	151,000
32	Jamestown	20,000
33	Lancaster	1,000
34	Lawrenceburg	22,500
35	Lebanon	10,000
36	Leitchfield	35,895
37	Lexington	161,600
38	Livermore	5,506
39	London	15,000
40	Louisville	1,705,600
41	Madisonville	32,000
42	Marion	INACTIVE
43	Mayfield	12,500
44	Maysville	9,000
45	Middlesboro	15,000
46	Monticello	8,000
47	Morganfield	1,500
48	Morgantown	30,000
49	Mt. Sterling	13,500
50	Murray	20,000
51	Nicholasville	15,000
52	Owensboro	61,000
53	Owingsville	INACTIVE

Table 5-5 (Continued)

No.	POTW	$/Year
54	Paducah	78,000
55	Paris	10,000
56	Princeton	18,000
57	Richmond	16,562
58	Russellville	14,900
59	Scottsville	INACTIVE
60	Shelbyville	19,180
61	Shepherdsville	19,000
62	Somerset	21,852
63	Springfield	6,000
64	Stanford	2,000
65	Tompkinsville	INACTIVE
66	Versailles	1,000
67	Williamsburg	15,000
68	Williamstown	4,500
69	Winchester	30,000
70	Wurtland	10,000
	TOTAL	$3,664,135

* Includes South Campbell County (County Fiscal Court)

Kentucky assesses pretreatment program effectiveness by reviewing wastewater sludge quality for five heavy metals: cadmium, copper, lead, nickel, and zinc. Sludge quality has shown continuous improvement in the 1984-93 period.

The National Pretreatment Excellence Awards recognize those publicly owned wastewater treatment plants that have developed and implemented effective and innovative pretreatment programs. EPA's award program was divided into four categories based on flow of the POTW: 0 to 2.0 MGD, 2.01 to 5.0 MGD, 5.01 to 20.0 MGD, and greater than 20 MGD. These categories have been changed to ones based on the number of significant industrial users (SIUs) served: 1-10, 11-20, 21-50, and greater than 50.

With the beginning of the awards program in 1989, Kentucky POTWs have fared well, with a total of five programs receiving the awards:

Year	POTW	Category
1989	Louisville MSD	(20 + MGD)
1990	Bardstown	(0 - 2.0 MGD)
	Richmond	(2.01 - 5.0 MGD)
1991	Leitchfield	(0 - 2.0 MGD)
-	Corbin	(2.01 - 5.0 MGD)

Municipal Facilities

Construction grants, state revolving loan fund monies, and other funding programs have resulted in the construction of more than $64 million in wastewater projects that came on line during 1992-1993 as indicated in Table 5-6. Twenty-six municipal wastewater projects were completed during this two year period. An additional 25 projects are in various stages of construction.

Although significant improvements in water quality have been realized through the construction of new wastewater treatment facilities, there are numerous needs that remain to be addressed. The 1992 Needs Survey, conducted by the DOW as part of its facilities planning process, indicated that municipal discharges continue to impair water quality and pose potential human health problems. State and federal minimum treatment requirements are not being met in every instance. The 1992 Needs Survey identified a capital investment need of $1.516 billion to construct and rehabilitate wastewater treatment facilities and components for Kentucky, based on the 1990 population. Backlog needs of $1.516 billion, coupled with long-range needs for publicly owned treatment facilities, reveal a projected total

Table 5-6. Wastewater Treatment Facilities That Came on Line During Calendar Years 1992 - 1993

Type of Funding/City	Date on Line	Design Flow (mgd)	Treatment Cost	Interceptors Cost
__Loan__				
Bowling Green	12/01/92	8.40	6,669,000	368,000
Bowling Green	06/18/93	-	226,000	198,000
Boyd Co. Fiscal	07/19/93	-	2,463,000	1,326,000
Brandenburg	07/28/93	0.19	1,931,400	0
Butler	05/15/93	0.14	383,850	0
Campton	04/29/92	0.10	592,775	0
Cumberland	09/24/93	0.50	1,222,700	144,000
Elizabethtown	08/12/93	7.20	8,453,000	0
Georgetown	10/28/93	2.34	6,009,300	0
Greenup	10/29/93	0.20	218,650	152,000
Lewisburg	02/10/93	0.35	622,091	0
London	12/17/93	4.0	3,124,495	4,024,010
Mayfield	07/30/92	3.10	3,719,000	0
Melbourne	12/10/93	-	916,090	0
Middlesboro	12/16/93	2.80	0	832,085
Pikeville	02/18/92	2.00	2,700,000	0
Providence	12/02/92	0.63	3,795,000	0
Reidland	01/06/93	-	0	1,847,500
Southshore	06/01/93	0.39	2,769,000	0
Williamsburg	11/15/92	0.80	1,024,110	0
Total			**46,839,961**	**8,891,595**
__Grant__				
Benton	03/31/92	1.00	181,333	0
Bradfordsville	01/25/93	0.04	940,904	0
Caveland (Hwy 70/I 65	12/26/92	0.50	0	746,340
Estill Co.	01/07/93	0.21	3,135,794	0
Franklin Co.	02/01/93	-	754,539	0
Hardin	09/30/92	0.10	362,331	0
Oak Grove	12/10/92	-	0	3,014,453
Total for EPA Funded Projects			**5,374,901**	**3,760,793**

need of more than $2.391 billion through the year 2012. EPA estimates that $1.090 billion of this money will be needed for nonpoint source control projects. A detailed breakdown of investment needs is presented in Table 5-7.

Table 5-7
Investment Needs for Wastewater Treatment Facilities in Kentucky 1992-2012
(In millions of January 1992 dollars)

Facility	For Current 1992 Population	Projected Needs 2012 Population
Secondary treatment	$270	$203
Advanced secondary treatment	59	35
Infiltration/Inflow	77	79
Major rehabilitation of sewers	20	19
New collector sewers	667	586
New interceptor sewers	391	348
Correction of combined sewer overflows	32	31
Nonpoint Source	0	1,090
Total	$1,516	$2,391

Kentucky has operated the state revolving loan fund (SRF) for five years. Forty-eight projects have been funded to date, committing $111 million in SRF money and totalling $137 million in project costs. Project costs have averaged $2.3 million, and have ranged from $178,085 to $10,890,000.

The SRF is proving to be a popular funding program for publicly owned wastewater treatment facilities. With interest rates ranging from 0.4 to 4.3%, the SRF is used for funding complete projects as well as to supplement grant-funded projects.

The funding formula for allocation of capitalization grants for SRF loans provides that Kentucky will receive 1.2872 percent of the authorized amount. This figure falls short of Kentucky's fair share whether compared on a needs or a population basis. A funding allotment percentage for Kentucky of approximately 1.55 percent would be more in line with needs and population figures. The estimated annual difference in available state revolving fund money would translate into two or three additional wastewater projects for Kentucky communities. A change in the allotment is being considered by Congress.

Wastewater Regionalization

The DOW has directed major efforts toward promoting wastewater regionalization. Small wastewater treatment plants, particularly those referred to as "package" plants, tend to be less effective and less efficient than larger plants. A majority of Kentucky's 2859 non-municipal permitted wastewater treatment facilities are package plants. Regional wastewater treatment facilities eliminate discharges from many of these existing small plants by diverting the flow to a larger facility or by combining two or more existing facilities into a new or selected regional treatment facility. Regional facilities also prevent new discharges by requiring connection to an existing facility or creating sanitary districts and regional wastewater authorities.

The DOW is working to raise the public and technical sector awareness about the need for regionalization. Several presentations have been made and more are scheduled around the state. Further, there is a coordinated effort to ensure that the various branches within the DOW promote the concept through their actions and contracts. As part of the regionalization effort, the DOW obtained information on wastewater facilities in 38 counties. Maps of these counties were prepared using Geographic Information System (GIS) data. The maps show streams, roads, cities, and permitted wastewater treatment facilities and are used in the DOW's educational and promotional efforts. A cooperative effort by the DOW, the Purchase Area Development District, and the U.S. Geological Survey combined appropriate data. Data compiled by the DOW on the performance of 757 private facilities and 58 small municipal plants in the 38 counties from April 1989 through March 1990 indicated that performance of these facilities was not good. DOW personnel have visited 15 of the 38 counties to encourage regionalization.

Since 1990, the DOW has used 100% federal funds from Section 205(j)/604(b) of the Clean Water Act to assist it and regional planning organizations in developing regionalization approaches to treat wastewater (Table 5-8). The program stipulates that 40% of the federal funds received since Federal Fiscal Year (FFY) 1988 be passed through to local or regional planning entities for water quality management planning activities. The DOW has expressly required recipient agencies to pursue regionalization activities with this funding. The objective of this initiative is to discourage the construction of new, small privately owned package treatment plants and to assist in improving the performance of package plants for which regionalization is not feasible. Contracts with six area development districts, one regional health organization, and the Council of State Governments have provided information for the development of regionalization strategies at the state and local level. These agencies have provided technical assistance to many plants to enhance water quality.

Kentucky's 15 Area Development Districts (ADDs) are regional planning agencies empowered to engage in the work of program development through administrative, research, and planning efforts in their constituent counties in order to encourage the development of public and private property in the most appropriate relationships. Among their many duties, the ADDs may advise municipalities and special districts seeking technical and financial

Table 5-8
Section 205(j)/604(b) Water Quality Management Planning Funds
FFY 1988-1993

	FFY 1988	FFY 1989	FFY 1990	FFY 1991	FFY 1992	FFY 1993	TOTAL
Bluegrass ADD	$44,000	$32,000		$32,000			$108,000
Purchase ADD		$32,011	$69,400	$17,177	$24,823	$50,000	$193,411
Big Sandy ADD		$32,000	$29,400	$7,684	$26,916		$96,000
Council of State Governments	$5,428			$17,872			$23,300
Gateway District Health Dept.	$31,000			$31,000	$4,560	$31,000	$97,560
Lake Cumberland ADD	$36,500						$36,500
Green River ADD						$30,000	$30,000
Kentucky River ADD						$33,000	$33,000
TOTAL	$116,928	$96,011	$98,800	$105,733	$56,299	$144,000	$617,771

support for wastewater treatment projects (e.g., selecting engineering services, applying for federal grant/loan funding). Most ADDs also provide management assistance (e.g., budgeting, personnel policies) to wastewater utilities. Some ADDs provide wastewater facilities with assistance in day-to-day utility operation and maintenance.

The **Bluegrass Area Development District** (BGADD) in central Kentucky participated in the Section 205(j)/604(b) program from FFY 1990-92 and continues to support regionalization through its role in comprehensive planning assistance. With its pass-through funding, BGADD staff identified wastewater facilities in noncompliance or in or near bankruptcy and targeted them for technical assistance and regionalization efforts. The BGADD has further promoted regionalization language in comprehensive plans and subdivision regulations in several counties. In cooperation with the Rural Water Association, the DOW, and the Farmers Home Administration, the BGADD also prepared a Kentucky Rural Wastewater Assistance Manual for Policymakers. The document provides local officials with an understanding of the planning, design, funding, and operation of wastewater treatment facilities, and familiarizes these decision makers with the DOW's regionalization efforts. Through the Section 205(j)/604(b) program, the BGADD's efforts have eliminated nine package plants and extended first-time sewer service to 1400 (0.3%) of residents in the district.

The **Gateway District Health Department** (GDHD) has contracted with the DOW for wastewater regionalization activities in eastern Kentucky since 1990. The GDHD promotes public awareness of wastewater treatment issues, trains package plant operators, and publicizes the regionalization concept. Most notably, the GDHD completed an innovative and successful water/wastewater education project for students at Ezel Elementary School in the fall of 1992. The GDHD is now bringing the Ezel program to other schools in the Gateway Region. GDHD has also conducted rural wastewater disposal system surveys in the Gateway counties in an effort to identify areas where small-scale methods of sewage disposal are not working, assisted land owners in taking appropriate corrective action, and assessed people's knowledge of wastewater systems in order to develop effective educational programs. Gateway officials have been instrumental in securing public support in several unsewered communities for sewer line extension to regional facilities. Since entering the Section 205(j)/604(b) program, the GDHD's efforts have already eliminated three package plants, and another five will be eliminated upon completion of the current projects described above. Through the GDHD's work, first-time sewer service will have been extended to nearly 5% of the total households in the Gateway region by 1995.

The **Lake Cumberland Area Development District** (LCADD) in south-central Kentucky received Section 205(j)/604(b) funding in 1990-91 to oversee an environmental and economic feasibility analysis of wastewater treatment options to serve the city of Burnside. Following discussions with the DOW, the consulting firm retained by LCADD to conduct the value engineering study recommended a system to provide secondary treatment in a lagoon treatment facility and pipe effluent to irrigate the nearby General Burnside Golf Course. Accordingly, Burnside has prepared a Section 201 Facilities Plan to implement this proposal. This plan has not yet received funding assistance, but the Section 205(j)/604(b)-funded study has laid most of the technical groundwork for the project. Burnside thus should be able to proceed quickly when it does receive funding for facility construction.

The **Purchase Area Development District** (PADD) in western Kentucky has participated in the Section 205(j)/604(b) program since FFY 1990. The PADD's not-for-profit Purchase Public Service Corporation (PPSC) provides technical assistance to several wastewater facilities in the ADD. The PPSC also contracts to provide routine operation and maintenance services and has even assumed ownership of plants. The PPSC performs necessary repairs or modifications to such forfeited systems and seeks to incorporate them into more comprehensive systems where possible. Since entering the Section 205(j)/604(b) program, the PADD has assumed direct ownership of six package plants, of which two have been eliminated. Staff provide routine operational assistance to at least six package plants and ad hoc consultant service to approximately 15 to 20 others.

The **Big Sandy Area Development District** (BSADD) in eastern Kentucky participated in the Section 205(j)/604(b) program from FFY 1990-1992 and will seek funding again in FFY 1994. The ADD offers technical and financial expertise to wastewater treatment plants that are having problems meeting permit requirements. The ADD also works to eliminate poorly operated package plants, find alternatives for inadequate systems, and raise public awareness of wastewater treatment problems in the region. With the aid of concerned citizens, the BSADD continues to discover unpermitted, previously unknown package plants and report them to the DOW. Since entering the Section 205(j)/604(b) program, the BSADD estimates that regionalization efforts have eliminated or identified as no longer in operation approximately 29 package plants, identified 15 unpermitted package plants for incorporation into the KPDES program, helped implement line extensions to more than 70 residences and businesses, and resolved problems involving more than 20 failing package plants.

The **Green River Area Development District** (GRADD) in western Kentucky entered the Section 205(j)/604(b) program in FFY 1993. The ADD is working to encourage several communities to plan and seek funding for new or expanded wastewater facilities. The GRADD is also working to establish a Small Wastewater Systems Technical Assistance Program (SWSTAP) to provide technical and financial planning assistance to the owners and operators of small systems on a regular basis.

The **Kentucky River Area Development District** (KRADD) in southeastern Kentucky entered the Section 205(j)/604(b) program in FFY 1993 to address sewage problems in the North Fork of the Kentucky River. The DOW has issued swimming advisories on the North Fork for the last three years, citing excessive levels of fecal coliform bacteria. DOW enforcement has brought almost all municipal and package treatment plants into compliance and improved water quality enough to justify lifting the swimming advisory on the lower 76 river miles in June 1993; however, high bacteria levels upriver still indicate a pervasive problem. DOW and KRADD staff have organized a multi-agency task force to deal with the issue. The core working group, composed of personnel in the KRADD, DOW, Cabinet for issue. The core working group, composed of personnel in the KRADD, DOW, Cabinet for Human Resources, Kentucky River District Health Department, and Division of Plumbing, has solicited input from local citizens and elected officials. Much of the remaining problem is attributed to residential straight-pipe discharges of raw sewage and failing septic systems. Based on their findings, the task force anticipates promoting regionalization. The group has also developed a proposal for funding under the Section 319 nonpoint source pollution program to implement a watershed demonstration project to address straight-pipe discharge or septic system problems in the upper North Fork Kentucky River. The funds will be used for education, BMP implementation, monitoring, and project management.

Progress in the regionalization effort was evident in 1990 when more discharge permits were inactivated than new ones were issued (Figure 5-5). New permits included discharges that served previously unsewered areas in the state, making the trend even more positive. Progress continued to be made in 1992 and 1993.

A significant reduction in the number of package plants across the state will soon be realized because of projects now in the planning or construction stages in Bath, Boone, Boyd, Daviess, Franklin, Jefferson, McCreary, Oldham, Perry, and Rowan counties. These projects will eliminate some 170 facilities.

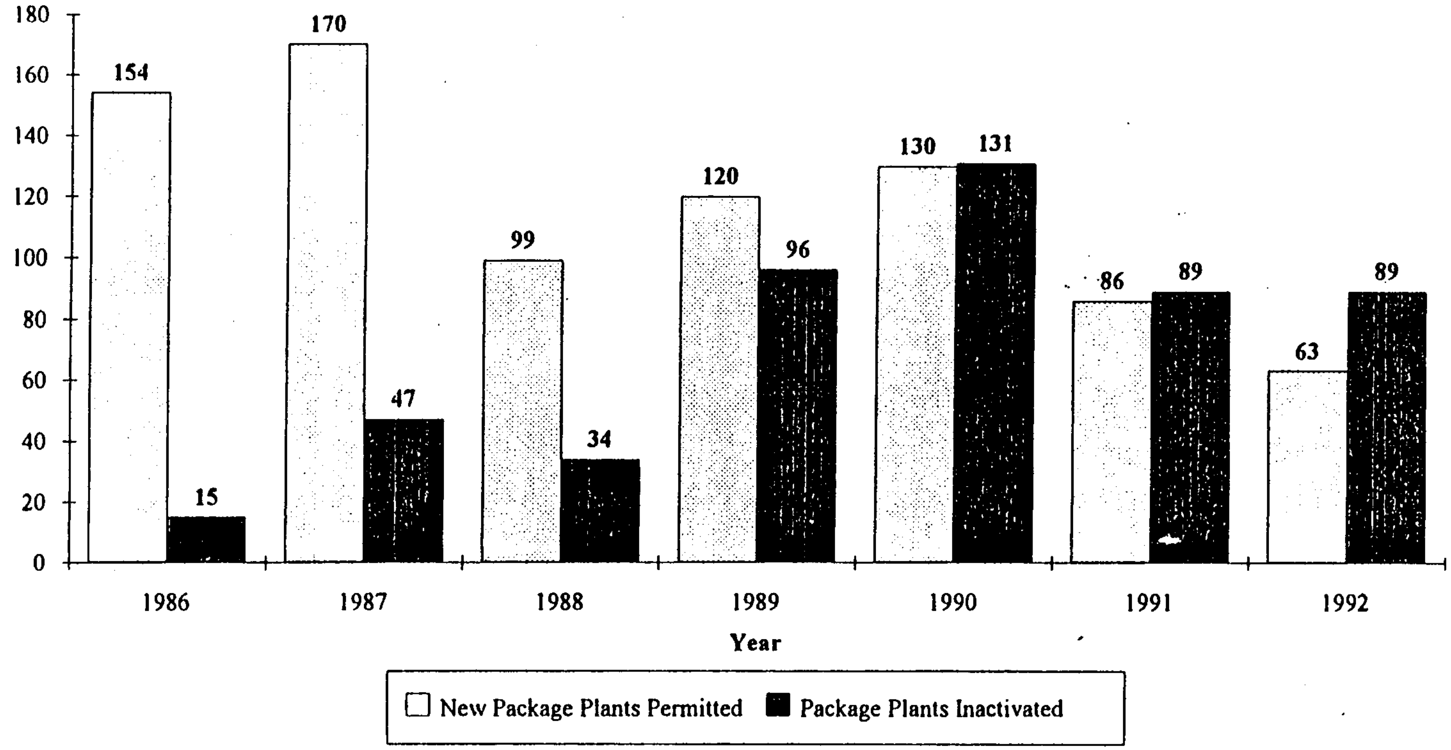
Boat Sewage Disposal

The divisions of Water and Water Patrol handle numerous complaints every year during the recreational season about sewage discharged from boats, especially houseboats. Citizens express concern about the aesthetic offenses and potential health problems associated with these discharges. On most water bodies in Kentucky, boats are not permitted to discharge any sewage, treated or untreated. However, state officials suspect that many of these boats either are not equipped with the required holding tank-type Marine Sanitation Device (a Type III MSD), or the owners simply empty the tank directly into the water. Even on water bodies where the state has no authority to prohibit treated discharges from approved "Type I" MSDs, boats equipped with the required MSD and moored in secluded coves or docked at marinas can cause localized water quality problems.

Early in 1993, staff from the DOW, Division of Water Patrol, and Department of Parks began developing a Memorandum of Understanding (MOU) to establish an arrangement for jointly addressing the problem. The MOU allocated responsibilities for education and construction activities as funds became available.

Even before the MOU was completed, staff discovered a guidance document on the recently announced Clean Vessel Act (CVA) grant program. Through the federal Clean Vessel Act of 1992 (Pub. L. 102-587), Congress has made funds available to both coastal and noncoastal states for the construction, renovation, operation, and maintenance of pumpout and waste reception facilities for sewage generated on boats and for public education efforts to encourage responsible boat sewage management. The grant program,

Figure 5-5
New Package Plant Permits v. Inactivations
1986-1992



administered through the U.S. Fish and Wildlife Service, will distribute $40 million in grant money over the next five years on a 75% match basis. Both public and private marinas are eligible to receive assistance, although the program must be administered through State agencies.

The Kentucky agencies participating in the MOU and the Department of Fish and Wildlife Resources (KDFWR) submitted an application for $212,000 in CVA funds in the fall of 1993. The KDFWR entered the grant proposal process when it was designated as Kentucky's Single Point of Contact to receive the federal CVA funds. Under the grant work plan, these agencies propose to construct boat sewage pumpout and waste reception facilities at four state-operated marinas in Kentucky and to conduct statewide educational efforts to encourage responsible boat sewage disposal and promote the use of pumpout facilities.

Education activities in the project would include brochures, public service announcements, and public meetings to educate boaters, marina operators, and boat manufacturers and retailers about proper boat sewage management. The DOW would obtain a database of boat owners in the state who are most likely to have onboard toilet facilities, in order to administer a questionnaire and provide the boat owners with information about the proper disposal of their boat sewage. Water Patrol officers would also visit marinas to provide education about proper boat sewage disposal and to assess sewage disposal needs. This proposed public education campaign is intended to raise awareness of the problems associated with boat sewage discharges, to encourage installation and proper use of Type III (holding tank) MSDs on all boats, (even those used on discharge water bodies), and to promote the use of existing and soon-to-be-constructed pumpout facilities.

Initial pumpout facility construction activities would take place at the state marinas in Jenny Wiley State Resort Park (Dewey Lake), Rough River State Resort Park, Dale Hollow State Park, and Buckhorn Lake State Park. These sites were proposed based on the availability of data to document the need for pumpout facilities and on the decision that state entities should take the lead in demonstrating responsible marina management. However, private marina owners have also begun to communicate interest in securing funding, and the agencies proposing to cooperate in the FFY 1994 project plan to include funding specifically for private-sector projects in their 1995 application .

The cooperating agencies plan to apply for more CVA funding in 1995 to expand their education efforts and to construct and upgrade more pumpout facilities around the state.

Section 401 Water Quality Certification

Statutory authority over water quality certification is contained in KRS 224.16-50. All existing uses of surface waters, including those of wetlands, are protected under Kentucky Water Quality Standards (401 KAR 5:026;029;031) even if the waters and their designated uses are not specifically listed in regulation. "Existing use" is defined as attainment of legitimate uses in or on a surface water of the Commonwealth on or after November 28, 1975 (401 KAR 5:029(1)(p)). The state may issue, waive, or deny water quality certification for any federally permitted or licensed activity that may result in a discharge into one acre or more of wetlands or 200 linear feet of blue-line stream as designated on a U.S.G.S. 7.5 minute (1:24,000) topographic map. The state is to certify that the materials to be discharged into surface waters of the Commonwealth will comply with the applicable effluent limitations, water quality standards, and any other applicable conditions of state law. Discharges may include, but are not limited to, dredged spoil, solid waste, garbage, rock, and soil. The DOW (1993) also has issued guidelines to mitigate unavoidable impacts to streams.

The state certification process is typically triggered through an individual Section 404 permit application and the associated COE Public Notice. Water quality certifications are also required for COE nationwide permits as listed in Table 5-9. Nationwide permits include discharge activities that are substantially similar in nature and have been determined by the COE to cause minimal adverse impacts to waters of the U.S. Water quality certifications of nationwide permits protect water quality and aquatic life from a wide array of discharge activities within waters of the Commonwealth.

Table 5-10 summarizes 401 certification activities for this 305(b) reporting period. While the program has become increasingly effective in protecting waters of the Commonwealth from activities not typically regulated by point source programs. There is a lack of sufficient resources for compliance assurance and enforcement programs. The COE and DOW need to significantly increase surveillance and enforcement activities in order to ensure permitted and unpermitted activities are not degrading or eliminating stream and wetland resources.

Nonpoint Source Pollution Control Program

The Kentucky Nonpoint Source Management Program provides a comprehensive description of Kentucky's strategy for controlling nonpoint source (NPS) pollution. The document was prepared by the DOW in accordance with the requirements of the Water Quality Act of 1987 and received full approval from the U.S. Environmental Protection Agency (EPA) in November 1989. The Management Program describes the control measures, including best management practices (BMPs), that Kentucky will use to control pollution resulting from each NPS pollution category (agriculture, construction, etc.) identified in the Kentucky Nonpoint Source Assessment Report, the programs to achieve implementation of those BMPs, and a schedule for implementing those programs.

The Kentucky Nonpoint Source Assessment Report is a detailed, comprehensive list of nonpoint impacts, including evaluated information obtained from a 1987 Nonpoint Source Pollution Survey. The water quality data in the report are used to identify NPS priority watersheds for pollution remediation activities. The Kentucky Nonpoint Source Assessment

TABLE 5-9: NATIONWIDE PERMITS (NWP)

NWP Number	WQC Status	Purpose
1	A	Aids to navigation
2	A	Structures in artificial canals
3	A	Maintenance
4	A	Fish & wildlife harvesting, enhancement and attraction devices and activities
5	A	Scientific measurement devices
6	A	Survey activities
7	A	Outfall structures
8	A	Oil and gas structures
9	A	Structures in fleeting and anchorage
10	A	Mooring buoys
11	A	Temporary recreational structures
12	B	Utility line backfill and bedding
13	B	Bank stabilization
14	B	Minor road crossing
15	B	U.S. Coast Guard approved bridges
16	C	Return water from upland contained disposal areas
17	B	Hydropower projects
18	C	Minor discharges
19	A	25 cubic yard dredging
20	A	Oil spill cleanup
21	B	Surface coal mining activities
22	A	Removal of vessels
23	B	Approved categorical exclusions
24	A	State administered Section 404 program
25	A	Structural discharge
26	B	Headwaters and isolated waters
27	B	Wetland and riparian restoration and creation activities
28	A	Modifications of existing marinas
32	A	Completed enforcement actions
33	B	Temporary construction, access and dewatering
34	A	Cranberry production activities
35	A	Maintenance dredging of existing basins
36	A	Boat ramps (no discharge in wetlands)
37	B	Emergency watershed protection and rehabilitation
38	B	Cleanup of hazardous and toxic waste
40	A	Farm buildings

(A) 401 water quality certification not required

(B) 401 general certification denied for activities disturbing >200 linear ft. of stream and/or >1 acre of wetland; individual certification required

(C) 401 general certification denied in total; individual certification required

Table 5-10: 401 Certification Activities		
	1992	1993
Section 404 activity	63	66
Nationwide activity	57	152
Certification issued	102	153
Certification waived	4	2
Certification denied	7	31
Certification exempt	4	32

Report and the NPS priority watershed information are available from the DOW's Nonpoint Source Pollution Control Program.

This Report to Congress on Water Quality contains an updated list of NPS impacted waterbodies (Appendix E). This list is a subset of the Kentucky Nonpoint Source Assessment Report and identifies only those waterbodies significantly degraded by NPS pollution and surface waters that do not fully support their designated uses.

Because nonpoint source pollution arises from a wide spectrum of diffuse sources throughout the Commonwealth, there are a variety of programs in a several agencies that address NPS pollution control. The DOW serves as the lead oversight agency for these programs. Agencies and institutions cooperating in the implementation of Kentucky's NPS Management Program include, but are not limited to, the Kentucky Division of Conservation (DOC), Division of Forestry, Division of Waste Management, Division of Pesticides, Department for Surface Mining Reclamation and Enforcement, Kentucky Conservation Districts, Kentucky Geological Survey, U.S. National Park Service, U.S. Soil Conservation Service (SCS), U.S. Agriculture Stabilization and Conservation Service (ASCS), U.S. Forest Service, U.S. Geological Survey, U.S. Army Corps of Engineers, Tennessee Valley Authority (TVA), University of Kentucky Water Resources Research Institute, University of Kentucky College of Agriculture, Western Kentucky University, The Nature Conservancy, and the American Cave and Conservation Association. The Kentucky nonpoint source program has received a total of $5,621,258 from EPA through Section 319 and Section 205(j)(5) grants for fiscal years 1990 through 1994 that provides funds for many of these programs. Matching non-federal funds have also been provided for the programs as required by Section 319.

Monitoring

Nonpoint source pollution problems in the waters of the Commonwealth originate from land-based activities. The direct interrelationship between land activities and water quality necessitates that both land and the aquatic environments be monitored and evaluated. To this end, the NPS Pollution Control Program has formed two on-site monitoring field teams. Each team consists of a DOW field team leader with an aquatic ecology background and a DOC or SCS field team member with an agronomy/agriculture background.

The actual collection, assessment, evaluation, and interpretation of both water quality and land-based data is the responsibility of the field teams. Physical characteristics, water chemistry, aquatic biological community structure, and land-based activities are different aspects of the waterbody's ecosystem that may be monitored. A multifaceted approach is necessary for NPS monitoring because of the mobility of NPS pollutants, the varying degrees of pollutant toxicity, the close interrelationship of land-based activities and NPS pollution, and the spatial and temporal variabilities that exist in natural, dynamic ecosystems. Nonpoint source standard operating procedures provide instruction and guidance in, and ensure standardization of, study plan development, station location selection, and monitoring of water quality, land use, land treatment, and weather. The Standard Operating Procedures for Nonpoint Source Water Quality Monitoring Projects (DOW, 1994) is available from the NPS Pollution Control Program.

Water quality monitoring is an important aspect of the NPS program, especially if monitored water quality data are lacking, existing NPS pollution problems need to be quantified, or documentation is needed to show changes in water quality where alterations in land use practices have occurred. Monitoring is an important component of NPS watershed pollution remediation demonstration projects.

Demonstration Projects

Mammoth Cave. Public awareness and concern over water quality problems affecting Mammoth Cave National Park resulted in the development of the Mammoth Cave Karst Area Water Quality Oversight Committee. Its purpose is to achieve coordination among citizens, land users, and government agencies in monitoring and improving water quality in this karst drainage area.

A multi-agency technical committee consisting of representatives from local and state SCS offices, ASCS, U.S. National Park Service, DOC, DOW, Kentucky Geological Survey, U.S. Geological Survey, TVA, University of Kentucky College of Agriculture, Western Kentucky University Department of Agriculture, and Western Kentucky University Center for Cave and Karst Studies was established to work with the Mammoth Cave Karst Area Water Quality Oversight Committee to develop a nonpoint source watershed pollution remediation project for the Mammoth Cave area. The DOW's role in the watershed project is focused on evaluating BMP effectiveness on select demonstration farms.

Local SCS and ASCS representatives prioritized farms in the Mammoth Cave project area as potential agricultural demonstration sites. Based on land resource needs, accessible water monitoring areas, and farmer cooperation, five farms were chosen as demonstration sites. The farms are being used to educate farmers in the project area about the use of best management practices (BMPs) for controlling nonpoint source pollution. BMPs have been implemented in a holistic, systems approach at two farms, and animal waste treatment facilities are planned for or have been installed at three other farms.

Multi-agency monitoring efforts are being used to document agricultural impacts on the quality of surface water, groundwater, and wetlands, and to address cross-media interactions. The DOW has developed monitoring study plans for each of the demonstration farms, has coordinated monitoring activities with other involved agencies, is monitoring water quality, and will interpret and document changes in water quality that relate to BMP implementation.

The DOW is employing different sampling techniques at the various demonstration farms. For the most part, monitoring focuses on stormwater runoff. Automatic samplers were installed at two farms to collect rain-event water samples for agronomic BMP evaluation. Animal waste management BMPs are also being evaluated at these two farms. Based upon a comparison of pre-BMP and post-BMP data at the animal waste management station, nutrients at the first farm are a fraction of what they previously were. Since the initiation of sampling at the agronomic monitoring station, various conservation practices have been employed to the cropfields being evaluated. Throughout the course of the sampling at this station, no significantly high levels of nutrients have been evident, and pesticides have been detected from only one sampling event. Pre-BMP data have been gathered at the second farm effort to monitor agronomic practices. Nutrient samples frequently yield total kjeldahl nitrogen (TKN) and nitrate-nitrate (NO_2+NO_3) nitrogen levels in the 1 to 6 mg/l range. Both TKN-N and NO_2 - NO_3 have been detected in excess of 10 mg/l at this farm. In addition, several pesticides have been detected.

Water quality monitoring efforts on the remaining three demonstration farms are designed to focus on animal waste management BMPs only. One of these farms has a feedlot operation that drains into a second-order stream. An upstream - downstream approach to biological, bacteriological, and physicochemical monitoring is being employed. Two automatic water samplers have been installed at this site, and several sets of pre-BMP data have been collected. The animal waste lagoon has not yet been installed at this site. A relatively large volume of pre-BMP data has been collected at this site. Based upon water chemistry data, bacteriological data, and evaluation of biological communities, both the downstream station, and to a lesser degree, the upstream station are impacted by animal waste. Because of animal access, which is influencing the upstream station, animal fencing and an animal waste lagoon will be installed at this site.

Another animal waste management demonstration farm has had an animal waste lagoon installed. Two sets of pre-BMP data were collected at this farm. Nutrient and fecal coliform levels were extremely high. Because the animal waste lagooon installed is a no-discharge system, it is probable that water quality has improved significantly at this location. Because the animal waste system is designed as a no-discharge system, post-BMP samples have not yet been collected.

The third animal waste management demonstration farm has also had an animal waste lagoon installed. Both pre-BMP and post-BMP water chemistry and bacteriological data have been collected at this farm. However, prior to the installation of the animal waste lagoon, some efforts were taken to control the animal waste. As a result, there does not appear to be a significant difference between pre-BMP and post-BMP or upstream vs. downstream data.

Upper Salt River/Taylorsville Reservoir Watershed. Fishery problems in Taylorsville Reservoir, including fish kills and suppressed fish production, have prompted multi-agency concern over the water quality in the Upper Salt River watershed, which is being degraded by excessive pollutant loadings of bacteria, nutrients, and sediment. Land use in the watershed is predominately agriculture. The U.S. Army Corps of Engineers (COE), Kentucky Department of Fish and Wildlife Resources, and DOW are further investigating the water quality and fishery problems in the watershed. A comprehensive water quality monitoring study plan, developed by nonpoint source field biologists, describes the specific objectives and activities of agencies involved in water quality monitoring in the Upper Salt River/Taylorsville Reservoir (USR/TR) watershed.

Agricultural best management practice (BMP) cost-share funds have been made available to remediate nonpoint source pollution in the watershed as part of a U.S. Department of Agriculture (USDA) five year Hydrologic Unit Area Water Quality (HUAWQ) project. The goal of the HUAWQ project is to abate or prevent water quality degradation in both surface and groundwater in the watershed. To achieve this goal, the identified sources of contamination are being addressed by the use of best management practices. For FFY91 through FFY93, the HUAWQ project received a total of approximately $850,000. In addition, $55,000 cost-share funds were awarded in FFY92 as part of a Water Quality Incentive Program for implementing non-construction, management-type BMPs.

One of the first nonpoint source monitoring initiatives in the watershed was an intensive bacteriological investigation. The bacteriological data were used to: (1) assess point source compliance; (2) determine support or nonsupport of primary contact recreation; and (3) target animal waste BMPs in the watershed. Another bacteriological investigation is scheduled for 1994 to determine if the animal waste management practices have reduced bacterial contamination in the watershed.

Taylorsville Reservoir is highly eutrophic and has experienced problems with low dissolved oxygen concentrations, algal blooms, suppressed fish production, and occasional fish kills. The reason for these problems is the elevated nutrient levels in the streams feeding the reservoir (U.S. Army Corps of Engineers, 1992). In an effort to alleviate these problems, the U.S. Soil Conservation Service, Kentucky Division of Conservation, COE, and the DOW have undertaken studies and projects to determine the nutrient concentrations in the reservoir and streams feeding the reservoir, specific sources of these nutrients, the amount of nutrient reduction needed to improve reservoir water quality, and methods to achieve the needed reductions. The U.S. Geological Survey is also assisting with high-flow water sample collection through a cooperative agreement with DOW.

The water quality data was analyzed, and a report titled Sources and Loadings of Total Phosphorous into Taylorsville Lake (Kentucky Division of Water, 1993) was produced. Data from 13 stations throughout the basin were used in this report. Samples were collected during low, median, and high flow events. Sampling continues at certain locations to provide a more extensive data base.

Information from this report will be used to calculate a TMDL to provide resource agencies with estimates for the reductions necessary to improve lake water quality. The agencies will then be able to determine the specific actions that can be taken to bring about these reductions. The report recommends that implementation of land management practices to reduce erosion and the creation of riparian zones along stream channels would have the greatest impact in reducing phosphorus concentrations in the streams draining to Taylorsville Reservoir. Point source discharges contribute a very small percentage of the total nutrient load to the lake.

Big South Fork/Bear Creek Interstate Watershed. The Big South Fork/Bear Creek demonstration project is located in an interstate watershed that lies in both Tennessee and Kentucky. Bear Creek flows north from Tennessee into Kentucky, where it joins with the Big South Fork of the Cumberland River. A large portion of the Big South Fork watershed is classified and operated as a National River and Recreation Area by the National Park Service. Nonpoint source pollution impacts to Bear Creek begin outside the Big South Fork National River and Recreation Area (BSFNRRA) in Tennessee. The lower portion of Bear Creek lies in Kentucky, mostly within the BSFNRRA.

The Bear Creek drainage is primarily affected by unreclaimed strip mines. The abandoned coal mine sites are characterized by heavily eroding spoil banks and acid mine drainage. Minimal reclamation efforts were implemented after mining, and consequently, severe water quality problems exist because of abandoned mine land runoff. The biological communities within Bear Creek are severely impacted by acid mine drainage, and the creek does not support the aquatic life use. Values for pH ranged from 4.3 to 8.2 SU, with an average value near 5.6 SU. These low pH values also affect contact recreational uses.

The goal of this project is to improve water quality by reducing acid mine runoff, improving stream and bank habitat, and improving citizen understanding of the project. To meet this goal, the Tennessee Nonpoint Source Program, in cooperation with the Tennessee Land Reclamation Program, developed a rehabilitation plan for the Bear Creek watershed that calls for the implementation of BMPs and water quality monitoring. The BMPs include drainage control structures, subsurface limestone drains (anoxic alkaline trenches), aeration, and artificial wetlands.

To document changes in water quality associated with BMP implementation, The Tennessee Nonpoint Source Monitoring Team is monitoring water quality in the Tennessee portion of Bear Creek before and after BMP implementation. The Kentucky Nonpoint Source Monitoring Team is supplementing Tennessee's activities by monitoring water quality at a station at the mouth of Bear Creek in Kentucky. To address possible temporal variability in water quality of Bear Creek, Rock Creek, a Kentucky Outstanding Resource Water, has been selected as an appropriate reference stream. An automatic water sampler was installed at the Bear Creek station to collect rain-event water samples for analysis. Quarterly biological monitoring is being conducted at both the impacted and reference stations in order to document recovery of the stream biota. To ensure that biological data from Tennessee and Kentucky are comparable, Tennessee Standard Operating Procedures are being used by Kentucky for this project.

Fleming Creek. Fleming Creek, a tributary of the Licking River, is 39 miles long and drains an area of 61,670 acres. The mainstem and tributaries are contained almost entirely within Fleming County in northeastern Kentucky. Fleming County ranks third statewide in number of dairy cattle. Eighty-five feedlot operations occur in this watershed. Moreover, an estimated 1.7 million cubic feet of animal waste is washed into local streams annually, resulting in water quality degradation.

A U.S. Department of Agriculture project proposal seeking BMP cost-share funds for the Fleming Creek watershed was approved for funding in 1992. The DOW and U.S. Department of Agriculture are cooperating agencies in this project area. DOW has the responsibility of monitoring the effectiveness of the pollution remediation activities in the watershed.

The water quality monitoring study plan developed for this project calls for monitoring activities in three distinct phases. The first phase consisted of a bacteria and nutrient survey throughout the watershed during both high and low flow conditions in the spring and summer of 1992. The main purpose of this phase was to examine the entire watershed with respect to point and nonpoint pollution sources to target those areas most affected by animal wastes. It is envisioned that this survey will be repeated once all BMPs are installed to determine if water quality improvements occurred as a result of BMP implementation.

The second phase consists of long-term monitoring at select stations to measure water quality changes in the watershed over time resulting from BMP installation. Nutrient water quality data is the focus of this monitoring phase.

The third phase consists of biological and physicochemical data collection at two of the more impacted tributaries within the watershed as well as a station located on Fleming Creek downstream of all proposed BMPs. This phase will supplement phase two physicochemical data collection. Biological communities will be biometrically compared over time to evaluate and document changes in community structure that reflect improvements in water quality.

To date, only pre-BMP water quality data have been collected. These data indicate that Fleming Creek has been impacted from animal waste. The bacteriological survey indicated that the entire watershed is affected. Stations were established on Fleming Creek and at the mouth of every major tributary within the watershed. Fecal coliform levels ranged from 500 colonies per 100 ML to over 15,000 colonies per 100 ML at the tributary stations for the high-flow event. Total phosphorus and nitrogen levels (TKN and NO_2 - NO_3) have been detected at elevated levels (1-3 mg/l), particularly at the tributary stations. Based upon algal data, eutrophic to hypereutrophic conditions occur at certain locations within the watershed. In addition, there is an unusually high number of tolerant macroinvertebrate species at Allison Creek station. However, a preliminary evaluation of biological communities in Fleming Creek does not indicate impairment. A more conclusive characterization of pre-BMP conditions will be provided to EPA in a report later this summer.

Data Collection/Data Management

A necessary and important function of the nonpoint source program is the collection and management of NPS-related information. The cooperative, multi-agency nature of the program prescribes the reliance upon, and utilization of, existing data such as land use classification statistics, baseline water quality values, and best management practice evaluations. To this end, an NPS document library has been developed. All NPS-related documents are cataloged, and pertinent data are entered on computer for future retrieval. In addition, a computer literature search service has been identified and utilized for accessing other scientific and technical information pertinent to the program. Several statewide databases have been identified and utilized, including county-specific fertilizer and pesticide databases.

Education

To a large extent, the implementation of BMPs to control NPS pollution relies upon voluntary adoption of BMPs by those who manage the use of Kentucky's land resources. Therefore, education plays a vital role in Kentucky's NPS Management Program. NPS education programs inform land users and other Kentucky citizens about the causes, consequences, and solutions (BMPs) for the various types and sources of NPS pollution.

The DOW nonpoint source program supports and coordinates with a wide spectrum of NPS education activities and programs conducted by a number of agencies and institutions. The DOW has provided program speakers for school classrooms, field days, environmental fairs, civic groups, trade organizations, and professional meetings. Additionally, exhibits and other educational materials have been provided for use in conferences, fairs, field days, and clean-up days.

Several NPS education projects supported by 319 funds have been or are currently being conducted under the oversight of the DOW NPS program:

- The slide/video program and accompanying brochure, "Every Time It Rains," a general introduction to NPS pollution problems in Kentucky targeted to the general public, was produced by the Center for Math, Science, and Environmental Education at Western Kentucky University (WKU).

- WKU is also producing a video program on abandoned minelands and water quality, targeted to general audiences in Kentucky and Tennessee. It centers on the Bear Creek/Big South Fork demonstration project as an example of how these problems can be solved.

- The Kentucky Division of Forestry developed a forestry NPS video, slide/tape show, brochure, and best management practices manual to promote the use of forestry best management practices.

- The Gateway Region Environment-Education Network (GRE-EN), based in the Gateway District Health Department, conducted a multi-faceted education program in the five-county Gateway region that targeted agriculture, septic systems, and illegal dumps.

- The Warren County Conservation District has been conducting a number of educational activities that present NPS pollution problems and solutions arising from construction and urban runoff in karst regions, including contractor field days and the construction of a high-quality portable exhibit.

- The American Cave Conservation Association (ACCA) built an exhibit in its American Museum of Caves and Karstlands, located in Horse Cave, which illustrates the many types of human activity that can pollute groundwater. ACCA is currently developing and implementing a statewide karst education program that includes a school curriculum, a series of newspapers for classrooms, and teacher training workshops.

- The Groundwater Education and Rural Well Water Testing Program conducted public educational meetings in most of Kentucky's 120 counties concerning groundwater quality. Private well water analysis and technical assistance to remedy problems revealed by the testing were made available to program participants.

- The Floyds Fork Community Education Project in Jefferson County is developing three video tape presentations for developers, residents of the Floyd's Fork watershed, and high school students. These programs present urban runoff water quality problems and solutions.

- The University of Kentucky Cooperative Extension Service is adapting the national Farmstead Assessment System (Farm*A*Syst) program for use in Kentucky and will produce sets of informational flyers and assessment worksheets and conduct a pilot program in at least two Kentucky counties. Farm*A*Syst is a comprehensive farm site assessment that helps rural residents and farmers assess the impact of their farmstead structures, soil geology, and management practices on groundwater quality.

The Water Watch program (described in other sections of this report) has proven to be a particularly valuable channel for educating citizens about NPS water quality problems and solutions. The Water Watch and NPS program staff are working to further expand Water Watch educational materials and programs to include more information on BMPs and NPS pollution control, train participants to identify land use activities that are contributing to NPS pollution of their adopted waterbody, and collect data about water quality, aquatic life, and aquatic habitat conditions, including supplemental monitoring for NPS demonstration projects. Specifically, the Water Watch Nonpoint Source Local Education Initiative, funded under Section 319, is conducting training workshops for selected Water Watch groups and is producing accompanying sets of specific localized publications and localized slide/video programs. It is also conducting a program for high school students to study the impact of spring rainstorms on stream water quality that utilizes immunoassay screening for pesticides.

Nonpoint Source Impacted Waterbodies

Appendix E of this report contains a series of tables that identify Kentucky waterbodies significantly impacted by nonpoint source pollution. The format used in these tables is illustrated in Figure 5-6. Information contained in the tables includes the waterbody code, waterbody (stream, lake, wetland, groundwater) name, NPS categories, parameters of concern, data sources, method of assessment, and designated uses not fully supported (for surface waters only).

Figure 5-6. Data Table Organization for Nonpoint Source Impacted Waters

WATERBODY CODE	STREAM NAME	NPS CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
KY050000101-018	FLEMING CREEK	14	10	16	80		BACT,NUTR, SED,MET	KNPS, 1987; KDOW-NPS, 1992	MONITORED	PCR

Waterbody Name and Code

The identification of waters impacted by NPS pollution consists of the name of the principal stream, lake, wetland, or groundwater site. The code (for streams and lakes) further delineates the waterbody being assessed and has been indexed in a computer storage and retrieval system for easy access to information compiled for the waterbody.

NPS Category

The categories and subcategories of NPS pollution sources for each of the listed waters and their codes were established in accordance with EPA's Nonpoint Source guidance. Refer to Appendix E for a listing of the codes and sources.

Additionally, the NPS categories were prioritized based on the severity of the NPS impact to a specific waterbody. Prioritized categories appear in numbered columns, indicating the relative severity of NPS impacts. Column one (1) identifies the NPS impact of greatest concern.

Parameters of Concern

This information indicates the parameters that significantly contribute to the NPS impacts. These parameters include sediment, nutrients, bacteria, chemicals, pesticides, and metals. See Appendix E for a list of the parameters and their abbreviations.

Data Sources; Monitored/Evaluated

The information identifying NPS impacts was gathered from many different sources. Both evaluated and monitored data were obtained and used to assess the NPS impacts to streams and lakes, wetlands, and groundwaters. Two levels of assessment were used to determine the impact of NPS pollution: monitored and evaluated. "Monitored" waters are those that have been assessed based on current site-specific water quality data. Waters were labeled as being "evaluated" if they were judged to be impacted by NPS pollution based on field observations, citizen complaints, fish kill reports, etc. Additionally, specific monitored, water quality data more than five years old were labeled as evaluated. A bibliography listing data sources used for assessing nonpoint source impacts is provided in Appendix E.

Uses Not Fully Supported

Kentucky water quality regulations classify streams based on identifiable uses. The stream use classifications are: Warmwater Aquatic Habitat (WAH), Coldwater Aquatic Habitat (CAH), Domestic Water Supply (DWS), Primary Contact Recreation (PCR), Secondary Contact Recreation (SCR), and Outstanding Resource Waters (ORW). The use classifications help protect public health and welfare and protect and enhance the quality of water for aquatic life. Partially supported designated uses are identified with a "P," and threatened designated uses are identified with a "T." Threatened use means that while a use or uses are fully supported in these waterbodies, NPS pollution arising from current land use activities in those watersheds could potentially make these waterbodies not support a use.

Surface and Groundwater Impacted by Nonpoint Source Pollution

Rivers, Streams, and Lakes. Nonpoint source pollution of Kentucky's rivers, streams, and lakes is widespread, occurring in virtually every county of the state. Agricultural activities are the major sources of NPS pollution in Kentucky, both in terms of statewide distribution and the severity of pollution within a given area or watershed.

Bacteria from uncontrolled feedlots, animal holding areas, unmaintained manure lagoons, pasture land, and cattle access to streams is the primary agricultural pollutant impacting the waters of the Commonwealth. Bacterial contamination prevents numerous stream and river miles from supporting swimming and other human contact recreational activities. High bacteria loads are indicative of water-borne pathogens that can cause human health problems.

Siltation from disturbed land is another common agricultural nonpoint source pollutant in Kentucky. It can cause navigational and flooding problems, threaten aquatic life, and transport large amounts of other pollutant materials. For example, nutrients and pesticides, two additional agricultural NPS pollutants, bind to and are transported along with sediment particles to streams and lakes. Other sources of agricultural NPS pollution include streambank erosion from unrestrained livestock, irrigated crop production, and specialty crop production (truck farming).

Surface coal mining activities are the most extensive and critical sources of NPS pollution that impact the streams and lakes of the Eastern and Western Kentucky Coalfields. Underground coal mine activities are a common secondary source of NPS pollution in these regions. Other mining-related nonpoint pollution sources in the state include runoff from limestone quarries and abandoned fluorspar mines.

Sediment, acid mine drainage, and elevated iron and sulfate concentrations are the principal pollutants associated with abandoned surface and underground coal mining activities. Sedimentation arises from stripping operations, haul roads, spoil banks on unreclaimed abandoned mine areas, deforested areas, sediment retention structures that have failed or do not operate properly, and sometimes surface disturbances associated with areas permitted for deep mining. Abandoned mines, which include underground mines and surface mines abandoned illegally or before mining regulations took effect, generally contribute the most severe acid water problems. Impacts from limestone quarries generally involve slight downstream increases in siltation and alkalinity.

Petroleum extraction activities occur in several regions of the Commonwealth. Improper brine discharges from oil and gas drilling operations result in high chloride levels, which in some areas are severe enough to eliminate aquatic fauna and adversely affect downstream public water supplies. Sedimentation from improperly constructed and maintained oil and gas facility service roads is also of concern.

Siltation of streams and lakes frequently results from silvicultural activities, or activities related to use of forest lands. Erosion can result from logging operations, saw mill runoff, reforestation, residue management, forest fires, haul road construction and maintenance, and woodland grazing of livestock. NPS pollution from silvicultural operations is widespread in Kentucky and is of special concern in steeply sloping areas.

Sediment is the major pollutant arising from several other source categories of NPS pollution. Construction activities (residential, commercial, or highway) can expose bare soil, resulting in severe erosion and sedimentation. Hydrologic habitat modification activities such as dredging, channelization, and flow regulation/modification, can alter the stream flow, disturb adjacent land area, and cause streambank erosion. Streambank erosion can also be caused by unrestrained access for livestock and increased runoff from impervious surfaces in urban areas.

Nonpoint source pollutants other than sediment are carried by runoff from several different categories of sources into Kentucky's streams and lakes. Stormwater runoff from urban areas washes nutrients, pesticides, bacteria, petroleum products, and a broad spectrum of other toxic substances into streams and lakes. On-site wastewater system runoff, especially from malfunctioning septic tanks and straight pipes, carries bacteria and nutrients to waterbodies. Solid waste and sewage is another frequently cited NPS pollution category. While garbage, refuse, and debris primarily clog watercourses and create aesthetic eyesores, they can also be a water quality problem because of pollutant residues remaining in the discarded containers and packaging. Finally, herbicides and other toxic substances that are used in highway and railroad right-of-way maintenance, discarded in landfills, or used in industrial land treatment have been reported to pollute Kentucky's streams and lakes.

Wetlands. Kentucky possesses a diversity and abundance of wetland resources. The major wetlands are identified as riverine, palustrine, and lacustrine. Human activities which adversely impact wetlands include resource exploration and extraction, agriculture, hydrologic/habitat modification, silviculture, and construction. Resource extraction activities of some type probably affect more acres of wetlands in Kentucky than any other category. Nonpoint source pollutants such as acid mine drainage and sedimentation have adversely impacted the water quality, soil saturation time, and vegetation of these wetlands. Another resource extraction activity, petroleum exploration and extraction, also has a detrimental effect on wetlands. Oil well drilling often results in modifications to the existing drainage patterns, with subsequent changes in adjacent wetland ecosystems. Additionally, oil spillage and brine discharges from active oil wells adversely impact wetlands.

Historically, the conversion of wetlands for agriculture has resulted in substantial losses of wetland resources in the Commonwealth. In addition to direct wetland loss through conversion, agricultural nonpoint source runoff containing high concentrations of sediments, nutrients, and pesticides can potentially degrade wetland areas.

Riparian wetlands are impacted by hydrologic/habitat modifications such as channelization and flood control activities. Straightening channels for flood control can prevent the natural flooding of wetlands and subsequently reduce their mineral and organic nourishment. Constructed levees can cut off wetlands from floodplains or increase water levels, both of which alter the natural soil saturation period and can cause an adverse change in wetland functions.

Another threat to wetland resources is silvicultural activities. Timber harvesting is periodically desired on wetland areas with large stands of timber. However, logging operations typically result in soil compaction and sedimentation, resulting in wetland alteration and degradation.

Wetlands in Kentucky are also affected by construction activities. Land development, highway construction, and other construction related activities can result in both wetland conversion and nonpoint source pollutant loading to adjacent wetlands.

Groundwater. One of the most valuable resources in Kentucky is the state's extensive groundwater system. Groundwater is susceptible to nonpoint source contamination. Karst regions, which comprise about 50 percent of the Commonwealth, are especially vulnerable. Approximately 48 of Kentucky's 120 counties are considered at high to moderate risk for groundwater contamination. The variety of geologic settings within Kentucky provide for significant local differences in the transport, accumulation, and breakdown of pollutants in the subsurface environment. The spatial variability of land uses also affects the distribution of pollutants in groundwater. Activities that can lead to groundwater contamination include agriculture, on-site sewage systems, waste disposal, resource exploration, development and/or extraction, improper well construction and operation, urban development, construction, underground injection of liquids, underground storage tank leakage, and spills.

Agricultural activities have a major impact on Kentucky's groundwater resources. Sedimentation is a common contaminant resulting from agricultural activities, especially in karst areas where sediment-laden streams sink into subterranean caverns. Other identified contaminants from agricultural activities are pesticides, nutrients, and bacteria. Some types of pesticides are soluble in water and are transported to aquifers by percolation of precipitation or by runoff from cropland. Excessive amounts of nitrates, nitrites, and bacteria can potentially render an aquifer useless. These contaminants may reach groundwater sources via percolation of precipitation through contaminated soil or runoff from animal feedlots, animal waste storage facilities, animal waste spreading operations, and sewage disposal systems.

Another major nonpoint source impact to Kentucky's groundwater is improperly constructed or maintained on-site sewage disposal systems. Bacteria, nutrients, and potentially hazardous chemicals are the major parameters of concern. Leakage from these systems percolates through the soil into groundwater sources. Contamination of well water by on-site sewage systems can pose serious health problems to well users.

Contaminants such as PCBs, metals, bacteria, and hazardous chemicals are major parameters of concern in leachate and runoff from inadequately constructed or maintained solid or hazardous waste disposal facilities. In karst areas, the relatively rapid rate of contaminant transport through the soil into the aquifer results in the decreased ability of the soil to filter contaminants from the water. Where a leak occurs in a facility's liner, contamination could be swift and extensive. Runoff from such areas can potentially cause serious degradation problems in groundwater systems. Illegal dumping of wastes into sinkholes, along roadsides, or in secluded areas may also impact groundwater resources.

Resource exploration, development, and extraction activities can cause regional nonpoint source groundwater contamination problems. Petroleum extraction activities, such as the construction and operation of oil and gas wells, can cause groundwater contamination. Elevated concentrations of chlorides and total dissolved solids in groundwater are associated with brine contamination from oil and gas well drilling activities. Brine can enter the groundwater system directly during the well drilling process via improper underground reinjection or as a result of water-flooding techniques commonly used for secondary petroleum recovery. Other parameters of concern from petroleum activities include metals and sulfates. Groundwater systems in Kentucky's coal regions are particularly vulnerable to NPS pollution impacts as well. The major parameters of concern regarding coal mining activities are elevated concentrations of metals and acid mine drainage. To a varying degree, groundwater quality near abandoned mines can be impacted by nonpoint source contaminants. The Division of Abandoned Lands has had a significant number of requests from local governments for assistance in developing public water supplies where existing groundwater sources have been adversely impacted.

Urban areas and construction activities have been identified as sources of nonpoint source contaminants of groundwater. In urban karst areas, groundwater is vulnerable to contamination by metals, bacteria, pesticides, and oil and grease from street runoff. Highly contaminated stormwater runoff can directly recharge groundwater through sinkholes used as auxiliary stormwater disposal facilities and sinking streams. Sediment is usually the major contaminant from construction activities.

Underground injection of liquid wastes, underground storage tanks, and spills are other NPS polluters of groundwater. Underground injection of liquid wastes will severely impact an aquifer if the substance is injected directly into the aquifer. The parameters of concern are dependent upon the identity of the injected liquid. Leaking underground storage tanks can also cause localized groundwater damage. Petroleum products can readily percolate into underlying aquifers. Spills of toxic materials can reach groundwater systems by percolation or surface water recharge. Contamination from a spill can cause major degradation of a groundwater source.

Not only does nonpoint source pollution affect the quality of groundwater used for drinking, it also threatens aquatic organisms. Subterranean river basins and aquifers provide a unique habitat for certain endangered and rare species. Three rare animal species, Amblyopsis spelaea (Northern cavefish), Typhlichthys subterraneus (Southern cavefish), and Palaemonias ganteri (Kentucky cave shrimp) are known to inhabit subterranean waters in Kentucky. Survival of these species is directly related to suitable groundwater quality in the Mammoth Cave region. The only known population of P. ganteri is found in the Mammoth Cave region. It is listed as a federally endangered species by the U.S. Fish and Wildlife Service because it "is in danger of extinction throughout all or a significant portion of its range." Both A. spelaea and T. subterraneus are candidates for federal listing.

Oil and gas drilling presently occurs in several groundwater basins that supply Mammoth Cave. Brine from such activities commonly reaches aquifers potentially creating physicochemical changes in groundwater quality. Finally, agricultural activities resulting in sedimentation, excessive nutrients, and the introduction of pesticides into the groundwater can potentially impact rare cave species.

Appendix E identifies groundwater basins that are known to be impacted by nonpoint source pollution. They were assessed using both evaluated and monitored data. Evaluated data were based on non-monitored water quality information provided by DOW groundwater staff and the U.S. Geological Survey. More baseline data are needed to effectively evaluate the extent of contamination present in Kentucky's groundwater.

CHAPTER 6

RECOMMENDATIONS

LIST OF RECOMMENDATIONS

The actions listed below are recommended to achieve further progress in meeting the goals and objectives of the Clean Water Act.

- The EPA should take the lead in developing a comprehensive framework for coordinating federal programs that have a groundwater element. To foster this, EPA should include appropriate portions of state-specific Comprehensive State Groundwater Protection Programs as conditions in grants awarded to agencies in the state that have groundwater protection responsibilities. Without additional funding, it will not be possible to direct resources to new initiatives and maintain current efforts.

- Guidance on stormwater and combined sewer overflow permitting is needed in regard to: development of wet weather criteria, appropriate governing stream flows for water quality-based permits, the need to apply human health-based criteria for carcinogens, appropriate sampling techniques, and available and appropriate treatment procedures.

- Kentucky has benefitted from Clean Lakes Program funding, yet EPA removes the funding from its budget, relying on Congress to appropriate money through lobbying efforts of states and concerned citizens and lake supporters. EPA should retain funding for this porgram in its budget.

- A national framework for antidegradation implementation should be developed on the federal level.

- State nonpoint source and groundwater programs need to be funded at least at current levels. Reductions in 1995 funding would be a significant set-back to the progress being made.

- Dissolved metal criteria should be established by means of appropriate research and use of clean laboratory techniques.

- The federal consistency provision of Section 319 needs to be enforced so that federal agencies in the state are aware that their programs are to be consistent with the Nonpoint Source Management Program. Kentucky's NPS program has been hampered because it is unable to require best management practices on federally funded projects.

- Research at the federal level is needed to develop a logical progression of steps to identify and determine ways to eliminate chronically toxic components of effluents. National guidelines are needed to develop consistency in the implementation of whole effluent toxicity limits with the NPDES program.

- EPA should increase technical and financial support for state efforts on Section 401 activities, particularly in the areas of enforcement and compliance. National guidance is needed on wetlands program applications regarding antidegradation and chemical, physical, and biological criteria development for use classifications.

- Amendments to the Clean Water Act that address watershed planning should be flexible and allow states to develop programs with a high potential to improve water quality. It may be inappropriate to tie all monitoring and permitting efforts to sequential watershed cycles when problems are not related to point sources.

- Section 404 permit conditions need to be actively enforced through a joint Corps of Engineers and EPA compliance assurance program.

- Kentucky recommends that the State Revolving Loan allotment formula be modified to reflect current wastewater treatment facility needs.

- EPA should actively assist states in promoting wastewater regionalization.

- Greater financial support and simplified administration requirements should be provided to small communities (< 3500 population).

APPENDIX A

TREND ANALYSIS STATISTICS

Table A-1: BAYOU DE CHEIN NR CLINTON		
Variables	Significance Level	Slope
SP COND	-99%	-1.9761
D.O.	+95%	.1753
pH	NS	.0000
CHLORIDE	-99%	-.2796
SULFATES	NS	-.1234
TSS	-95%	-.8326
NO2+NO3-N	-95%	-.0157
TOT. PHOS	-99%	-.0046
TOT. REC. CU	NS	.0000
TOT. REC. FE	NS	13.8783
TOT. REC. PB	NS	.0000
TOT. REC. ZN	NS	-.2082
FLOW	NS	-.1424

Table A-2: CLARKS RIVER AT ALMO		
Variables	Significance Level	Slope
SP COND	NS	3.9728
D.O.	NS	.0416
pH	NS	.0249
CHLORIDES	NS	.1388
SULFATES	+99%	.5163
TSS	-99%	-1.0025
NO2+NO3-N	NS	-.0100
TOT. PHOS	NS	.0113
TOT. REC. CU	NS	.0000
TOT. REC. FE	NS	21.6075
TOT. REC. PB	NS	.0000
TOT. REC. ZN	NS	-.5995
FLOW	NS	.0497

Table A-3: MAYFIELD CREEK NR MAGEE SPRINGS		
Variables	**Significance Level**	**Slope**
SP COND	+99%	3.9810
D.O.	NS	.2003
pH	NS	.0000
CHLORIDES	NS	.3043
SULFATES	+99%	.6708
TSS	NS	-.1655
NO2+NO3-N	+95%	.0215
TOT. PHOS	NS	-.0002
TOT. REC. CU	NS	.0000
TOT. REC. FE	NS	12.4829
TOT. REC. PB	NS	.0000
TOT. REC. ZN	NS	-.6241
FLOW	NA	

Table A-4: CUMBERLAND RIVER AT BURKESVILLE		
Variables	**Significance Level**	**Slope**
SP COND	+99%	2.6262
D.O.	NS	.0000
pH	-99%	-.0583
CHLORIDES	-95%	-.1125
SULFATES	NS	.2325
TSS	NS	-.1999
NO2+N03-N	-99%	-.0092
TOT. PHOS	-99%	-.0005
TOT. REC. FE	+99%	14.1950
TOT. REC. ZN	NS	.0000
FLOW	NS	69.9043

Table A-5: CUMBERLAND RIVER AT CUMBERLAND FALLS		
Variables	**Significance Level**	**Slope**
SP COND	NS	1.1945
D.O.	-95%	-.0855
pH	+99%	.0670
CHLORIDE	-99%	-.2353
SULFATES	NS	.1332
TSS	NS	-.4951
NO2+NO3-N	NS	-.0066
TOT. PHOS	-99%	-.0045
TOT. REC. CR	NS	.0000
TOT. REC. CU	-99%	-.2495
TOT. REC. FE	+95%	38.7611
TOT. REC. ZN	NS	.0000
FLOW	NS	16.2865

Table A-6: ROCKCASTLE RIVER AT BILLOWS		
Variables	**Significance Level**	**Slope**
SP COND	-95%	-2.9910
D.O.	NS	-.0502
pH	+95%	.0331
CHLORIDES	-99%	-.1453
SULFATES	NS	-.2375
TSS	NS	.0000
NO2+NO3-N	NS	-.0072
TOT. PHOS	-99%	-.0020
TOT. REC. CR	NS	.0000
TOT. REC. CU	-99%	-.5024
TOT. REC. FE	+99%	18.2862
TOT. REC. ZN	-99%	-1.1320
FLOW	NS	7.0241

Table A-7: CUMBERLAND RIVER AT PINEVILLE		
Variables	Significance Level	Slope
SP COND	NS	-3.6599
D.O.	-95%	-.0887
pH	+99%	.0613
CHLORIDE	-99%	-.3455
SULFATES	NS	.6882
TSS	NS	-.4146
N02+NO3-N	-99%	-.0090
TOT. PHOS	-99%	-.0066
TOT. REC. CR	NS	.0000
TOT. REC. CU	-95%	-.2505
TOT. REC. FE	NS	23.4014
TOT. REC. ZN	NS	.0000
FLOW	NS	14.7819

Table A-8: HORSE LICK CREEK NR LAMERO		
Variables	Significance Level	Slope
SP COND	NS	-.9899
D.O.	NS	.0000
pH	NS	.0000
CHLORIDES	-99%	-.3366
SULFATES	+99%	.7899
TSS	NS	.0000
NO2+NO3-N	-95%	-.0112
TOT. PHOS	-95%	-.0003
TOT. REC. CR	NS	.0000
TOT. REC. CU	NS	.0000
TOT.REC. FE	+95%	19.7843
TOT. REC. ZN	NS	-.4973
FLOW	NA	

Table A-9: LITTLE RIVER NR CADIZ		
Variables	**Significance Level**	**Slope**
SP COND	NS	-3.4782
D.O.	NS	.0316
pH	NS	.0000
CHLORIDE	NS	-.1097
SULFATES	NS	.3012
TSS	NS	.7738
NO2+NO3-N	NS	.0000
TOT. PHOS	-99%	-.0107
TOT. REC. CR	NS	.0000
TOT. REC. CU	NS	.0000
TOT. REC. FE	NS	33.9502
TOT. REC. ZN	NS	.0000
FLOW	+99%	10.4574

Table A-10: POND RIVER NR SACRAMENTO		
Variables	**Significance Level**	**Slope**
SP COND	NS	20.4753
D.O.	NS	-.0250
pH	+99%	.0496
CHLORIDES	-95%	-.3661
SULFATES	-95%	-9.5726
TSS	NS	.0000
NH3-N	-99%	-.0229
NO2+NO3-N	-99%	-.0513
TOT. PHOS	NS	-.0015
TOT. REC. CR	NS	.0000
TOT. REC. CU	-99%	-.2484
TOT. REC. FE	+99%	99.3991
TOT. REC. ZN	-99%	-1.7093
FLOW	NA	

Table A-11: ROUGH RIVER NR DUNDEE		
Variables	**Significance Level**	**Slope**
SP COND	NS	2.2574
D.O.	-95%	-.1004
pH	+99%	.0796
CHLORIDE	NS	.0199
SULFATES	NS	-.3478
TSS	NS	-1.0008
NH3-N	NS	.0020
NO2+NO3-N	-99%	-.0296
TOT. PHOS	NS	-.0012
TOT. REC. CR	NS	.0000
TOT. REC. CU	NS	.0000
TOT. REC. FE	+99%	119.5485
TOT. REC. ZN	NS	-.6684
FLOW	NS	4.3215

Table A-12: BARREN RIVER AT BOWLING GREEN		
Variables	**Significance Level**	**Slope**
SP COND	+95%	3.9819
D.O.	+99%	.0988
pH	NS	.0000
CHLORIDES	NS	-.1896
SULFATES	NS	.2508
TSS	-95%	-.8588
NO2+NO3-N	-95%	-.0162
TOT. PHOS	-99%	-.0017
TOT. REC. CR	NS	.0000
TOT. REC. CU	-99%	-.7979
TOT. REC. FE	+99%	40.7355
TOT. REC. PB	NS	-.1667
TOT. REC. ZN	-99%	-1.0153
FLOW	NS	3.1120

Table A-13: GREEN RIVER AT MUNFORDVILLE		
Variables	Significance Level	Slope
SP COND	NS	-1.5010
D.O.	NS	-.0374
pH	NS	-.0250
CHLORIDE	-99%	-1.0496
SULFATES	+99%	.6801
TSS	NS	.8337
NO2+NO3-N	NS	-.0108
TOT. PHOS	NS	-.0005
TOT. REC. CR	NS	.0000
TOT. REC. CU	NS	.0000
TOT. REC. FE	+99%	69.8882
TOT. REC. ZN	NS	.0000
FLOW	NS	-2.1267

Table A-14: BACON CREEK NR PRICEVILLE		
Variables	Significance Level	Slope
SP COND	+99%	5.2349
D.O.	NS	.0000
pH	NS	.0000
CHLORIDES	-99%	-.4498
SULFATES	NS	.1323
TSS	NS	.0000
NO2+NO3-N	-99%	-.0316
TOT. PHOS	-95%	-.0010
TOT. REC. CU	NS	.0000
TOT. REC. FE	+99%	40.6327
TOT. REC. ZN	NS	.0000
FLOW	+95%	1.4438

Table A-15: NOLIN RIVER AT WHITE MILLS		
Variables	Significance Level	Slope
SP COND	+99%	8.5086
D.O.	NS	.0000
pH	NS	.0000
CHLORIDE	+95%	.8239
SULFATES	+99%	.5974
TSS	NS	.0000
NO2+NO3-N	NS	-.0100
TOT. PHOS	NS	.0010
TOT. REC. CR	NS	.0000
TOT. REC. CU	NS	.0000
TOT. REC. FE	+99%	59.7549
TOT. REC. ZN	NS	.1338
FLOW	NS	3.6589

Table A-16: SALT RIVER AT SHEPHERDSVILLE		
Variables	Significance Level	Slope
SP COND	NS	-1.0000
D.O.	-95%	-.0997
pH	NS	.0000
CHLORIDE	-99%	-.5292
SULFATES	-99%	-1.0163
TSS	NS	.3345
NO2+NO3-N	-99%	-.0962
TOT. PHOS	NS	-.0049
TOT. REC. CR	NS	.0000
TOT. REC. CU	-99%	-.2250
TOT. REC. FE	+99%	61.4526
TOT. REC. ZN	-95%	-.9983
FLOW	NS	5.2446

Table A-17: POND CREEK NR LOUISVILLE		
Variables	Significance Level	Slope
SP COND	NS	-1.7822
D.O.	NS	-.0250
pH	NS	.0000
CHLORIDES	-95%	-1.1179
SULFATES	-99%	-2.2272
TSS	-99%	-1.9870
NH3-N	-99%	-.0585
NO2+NO3-N	-99%	-.1057
TOT. PHOS	-99%	-.0982
TOT. REC. CR	NS	.0000
TOT. REC. CU	-99%	-.3321
TOT. REC. FE	+95%	67.8280
TOT. REC. ZN	NS	-1.5103
FLOW	NS	-.7995

Table A-18: BEECH FORK NR MAUD		
Variables	Significance Level	Slope
SP COND	NS	.6905
D.O.	-99%	-.1752
pH	NS	.0000
CHLORIDE	-99%	-.2714
SULFATES	NS	.0493
TSS	NS	.0000
NO2+NO3-N	NS	-.0143
TOT. PHOS	NS	.0050
TOT. REC. CR	NS	.0000
TOT. REC. CU	NS	.0000
TOT. REC. FE	+99%	73.8410
TOT. REC. ZN	NS	.0000
FLOW	NS	4.0556

Table A-19: EAGLE CREEK AT GLENCOE		
Variables	Significance Level	Slope
SP COND	NS	-24.7511
D.O.	NS	-.0990
pH	NS	-.1381
CHLORIDES	-99%	-.2828
SULFATES	NS	-6.4684
TSS	+95%	4.7767
NO2+NO3-N	NS	.0352
TOT. PHOS	NS	.0208
TOT. REC. CU	-95%	-2.0117
TOT. REC. FE	NS	109.4007
TOT. REC. ZN	NS	-1.6743
FLOW	NS	1.4993

Table A-20: KENTUCKY RIVER AT FRANKFORT		
Variables	Significance Level	Slope
SP COND	NS	-3.8768
D.O.	NS	-.0666
pH	NS	-.0167
CHLORIDE	-99%	-1.2335
SULFATES	NS	-.6028
TSS	NS	.7490
NO2+NO3-N	NS	-.0245
TOT. PHOS	NS	.0004
TOT. REC. CR	NS	.0000
TOT. REC. CU	NS	.0000
TOT. REC. FE	+99%	87.9332
TOT. REC. ZN	-99%	-1.6075
FLOW	+95%	143.9117

Table A-21: KENTUCKY RIVER AT CAMP NELSON		
Variables	Significance Level	Slope
SP COND	NS	-4.9930
D.O.	-99%	-.1626
pH	NS	-.0155
CHLORIDES	-99%	-1.0960
SULFATES	NS	-.6684
TSS	NS	1.0005
NO2+NO3-N	-95%	-.0189
TOT. PHOS	NS	-.0016
TOT. REC. CR	NS	.0000
TOT. REC. CU	NS	.0000
TOT. REC. FE	+95%	31.9334
TOT. REC. PB	-99%	-.1992
TOT. REC. ZN	NS	-.3343
FLOW	+99%	185.2925

Table A-22: NORTH FORK KENTUCKY RIVER AT JACKSON		
Variables	Significance Level	Slope
SP COND	NS	7.3470
D.O.	NS	.0000
pH	NS	.0000
CHLORIDE	NS	-.1397
SULFATES	NS	-1.4931
TSS	NS	-.2693
NO2+NO3-N	-99%	-.0224
TOT. PHOS	-99%	-.0020
TOT. REC. CR	NS	.0000
TOT. REC. CU	NS	.0000
TOT. REC. FE	NS	44.7819
TOT. REC. ZN	NS	-.3254
FLOW	+99%	44.9606

Table A-23: MIDDLE FORK KENTUCKY RIVER AT TALLEGA		
Variables	Significance Level	Slope
SP COND	NS	1.1841
D.O.	NS	.0000
pH	NS	.0000
CHLORIDES	-99%	-.2079
SULFATES	NS	-.5464
TSS	NS	.1429
NO2+NO3-N	NS	-.0054
TOT. PHOS	-99%	-.0018
TOT. REC. CR	NS	.0000
TOT. REC. CU	NS	.0000
TOT. REC. FE	NS	-17.6854
TOT. REC. ZN	NS	.0000
FLOW	+99%	21.4831

Table A-24: SOUTH FORK KENTUCKY RIVER AT BOONEVILLE		
Variables	Significance Level	Slope
SP COND	NS	.5647
D.O.	NS	-.0200
pH	NS	.0000
CHLORIDE	NS	-.0478
SULFATES	NS	-.7095
TSS	NS	.0000
NO2+NO3-N	-99%	-.0204
TOT. PHOS	-99%	-.0010
TOT. REC. CR	NS	.0000
TOT. REC. CU	NS	.0000
TOT. REC. FE	NS	22.0854
TOT. REC. ZN	NS	-.0516
FLOW	+95%	19.9863

Table A-25: SOUTH ELKHORN CREEK NR MIDWAY		
Variables	Significance Level	Slope
SP COND	-99%	-17.0147
D.O.	+99%	.4617
pH	+99%	.0857
CHLORIDES	-99%	-3.2434
SULFATES	-99%	-2.3745
TSS	NS	.0000
NH3-N	-99%	-.5350
NO2+NO3-N	+99%	.3631
TOT. PHOS	-99%	-.1200
TOT. REC. CR	NS	.0000
TOT. REC. CU	NS	.0000
TOT. REC. FE	+95%	15.0464
TOT. REC. PB	NS	.0000
TOT. REC. ZN	NS	.3095
FLOW	NS	1.9891

Table A-26: DIX RIVER NR DANVILLE		
Variables	Significance Level	Slope
SP COND	NS	2.8104
D.O.	NS	.0996
pH	NS	.0000
CHLORIDES	NS	.0166
SULFATE	NS	-.0751
TSS	NS	.4494
NO2+NO3-N	NS	.0231
TOT. PHOS	NS	-.0030
TOT. REC. CR	NS	.0000
TOT. REC. CU	NS	.0000
TOT. REC. FE	NS	23.7878
TOT. REC. ZN	-95%	-1.4886
FLOW	+99%	16.0970

Table A-27: RED RIVER AT CLAY CITY		
Variables	Significance Level	Slope
SP COND	-99%	-7.9781
D.O.	NS	.0335
pH	NS	.0000
CHLORIDE	-99%	-2.7023
SULFATES	+99%	.7679
TSS	NS	.0000
NO2+NO3-N	-95%	-.0179
TOT. PHOS	-95%	-.0026
TOT. REC. CR	NS	.0000
TOT. REC. CU	NS	.0000
TOT. REC. FE	+99%	90.0616
TOT. REC. ZN	NS	-1.1080
FLOW	NS	2.7599

Table A-28: TUG FORK AT KERMIT		
Variables	Significance Level	Slope
SP COND	NS	3.1691
D.O.	NS	.0402
pH	+99%	.0745
CHLORIDES	-99%	-.6697
SULFATES	NS	1.3210
NO2+N03-N	+99%	.0354
TOT. PHOS	-99%	-.0040
TOT. REC. CR	NS	.0000
TOT. REC. CU	NS	-.1249
TOT. REC. FE	+95%	56.1326
TOT. REC. PB	+99%	.2497
TOT. REC. ZN	NS	-.4966
FLOW	NS	5.2518

Table A-29: LEVISA FORK NR PIKEVILLE		
Variables	Significance Level	Slope
SP COND	NS	4.4047
D.O.	NS	.0331
pH	+99%	.0986
CHLORIDE	+95%	.5015
SULFATES	NS	1.6397
TSS	NS	-.4981
NO2+NO3-N	NS	.0098
TOT. PHOS	-99%	-.0030
TOT. REC. CU	NS	.0000
TOT. REC. FE	+95%	38.2460
TOT. REC. ZN	NS	.0000
FLOW	NS	13.4908

Table A-30: TYGARTS CREEK NR LOAD		
Variables	Significance Level	Slope
SP COND	NS	-.8741
D.O.	NS	-.0543
pH	+99%	.0711
CHLORIDES	NS	-.2784
SULFATES	+99%	.6585
TSS	-99%	-1.0144
NO2+NO3-N	NS	.0000
TOT. PHOS	-99%	-.0020
TOT. REC. CR	NS	.0000
TOT. REC. CU	NS	.0000
TOT. REC. FE	NS	16.5009
TOT. REC. ZN	NS	.0000
FLOW	NS	.4228

Table A-31: LITTLE SANDY RIVER NR ARGILLITE		
Variables	**Significance Level**	**Slope**
SP COND	NS	4.4175
D.O.	NS	.0000
pH	+99%	.0665
CHLORIDE	NS	-.5007
SULFATES	NS	-.2370
TSS	NS	-1.7389
NO2+NO3-N	+95%	.0218
TOT. PHOS	NS	.0000
TOT. REC. CR	NS	.0000
TOT. REC. CU	NS	.0000
TOT. REC. FE	NS	40.1492
TOT. REC. ZN	NS	.9938
FLOW	NS	.0000

APPENDIX B

FISH KILL INVESTIGATIONS SUMMARY (1992-93)

Appendix B
Fish Kill Investigations Summary (1992-1993)

County	Waterbody	Date	Miles Affected	Pollutant	Number of Fish
Breathitt	Meatscaffold Creek & Quicksand Creek	02-14-1992	11.90	Diesel Fuel	60
Clinton	Spring and Smith Creeks	11-20-1992	3.60	Petroleum	-
Fayette	Unnamed Trib. to Wolf Run	05-21-1992	-	Possibly Chlorine	-
Grayson	Hargus Creek	03-12-1992	2.60	Oil	48317
Henry	Salt Creek	09-03-1992	1.00	Milk and Diesel Fuel	25
Jefferson	Beargrass Creek	07-23-1992	3.50	Ammonia	14978
Jefferson	Cedar Creek	06-24-1992	0.50	Unknown	-
Jefferson	South Fork Beargrass Creek	06-16-1992	0.75	Untreated Sewage	-
Jefferson	Beargrass Creek	05-09-1992	1.00	Lime Suspected	-
Logan	Little Whippoorwill Creek	08-31-1992	3.60	Tannic Acid	3034
Marshall	Unnamed Slough	01-30-1992	-	Lime	3686
Monroe	Mill Creek	04-09-1992	3.40	Unknown	25412
Nelson	Cox Creek	06-04-1992	0.20	Agricultural Liquors	-
Pendleton	South Fork Grassy Creek	09-28-1992	1.40	Animal Waste(Rendering Plant)	5281
Pulaski	Stinking Creek	10-30-1992	0.25	Fuel Oil	-
Taylor	Stoner Creek	07-30-1992	0.75	Unknown	66
Sub-total (1992)	16		34.25	-	100,859
Carter	Tygarts Creek	07-10-1993	0.25	Sewage	-
Jefferson	Drainage Ditch at Louisville Downs	08-05-1993	-	Blue Green Algae (Anabaena Sp.)	50
Jefferson	Unnamed Trib of South Fk Beargrass Creek	10-18-1993	2.00	Chlorine	-

Fish Kill Investigation Summary (1992-1993)

County	Waterbody	Date	Miles Affected	Pollutant	Number of Fish
Morgan	North Fork Licking River	07-21-1993	2.00	Molasses/Feed Mixture	-
Scott	Eagle Creek	08-23-1993	0.06	Lime	10
Sub-total (1993)	5	-	4.31	-	60
Total (1992-1993)	21	-	38.76	-	100,919

APPENDIX C

CURRENT ESTIMATE OF WETLAND ACREAGE FOR KENTUCKY WATERBODIES

APPENDIX C: CURRENT ESTIMATE OF WETLAND ACREAGE FOR KENTUCKY WATERBODIES

WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
Big Sandy Basin								
KY5070201-001 KY5070201-002	Tug Fork Mainstem Rockcastle Creek Basin	2.02	6	70.27	216.49			392.74
KY5070201-003	Wolf Creek Basin	0.56		65.09	76	37.67		228.82
KY5070201-004 KY5070201-005	Tug Fork Basin Big Creek Basin		3.45		32			60.74
KY5070201-006	Pond Creek Basin	5.14		1.72	2.95			265.33
KY5070201-008	Blackberry Creek Basin				3.69			138.11
KY5070201-009	Peter Creek Basin				44.46			66.32
KY5070201-010	Knox Creek Basin			1.77	21.2			105.43
KY5070202-001 KY5070202-004 KY5070202-007 KY5070202-008L01 KY5070202-009 KY5070202-010	Levisa Fork Mainstem Russell Fork Mainstem Levisa Fork Mainstem Fishtrap Lake Fishtrap Lake Tribs Levisa Fork Mainstem	9.44	32.89	5.29	32.91	1075.24		217.41
KY5070202-002	Shelby Creek Basin		7.81	12.19	29.73			
KY5070202-003	Levisa Fork Minor Tribs	4.21		1.02	2.87			29.21
KY5070202-005	Elkhorn Creek Basin			2.12	31.83			156.58
KY5070202-006	Marrowbone Creek Basin		0.27	0.54	10.25			64.43
KY5070203-001 KY5070202-004 KY5070203-010	Levisa Fork Mainstem Levisa Fork Minor Tribs Levisa Fork Mainstem	0.47		84.7	179.01			845.38

APPENDIX C: CURRENT ESTIMATE OF WETLAND ACREAGE FOR KENTUCKY WATERBODIES

WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5070203-002	Georges Creek Basin		1.33	6.23	48.58			4.7
KY5070203-003	Toms Creek Basin			7.13	23.37			54.62
KY5070203-005 KY5070203-009	Paint Creek Mainstem Paintsville Lake Tribs		6.01	14.29	81.93			118.08
KY5070203-006	Jennys Creek Basin	4.77		1.9	17.28			5.72
KY5070203-007	Mudlick Creek Basin			1.11	27.18			
KY5070203-013 KY5070203-012L01	Johns Creek Upper Basin Dewey Lake	44.63	15.47	39.09	74.56	929.22		21.29
KY5070203-014	Middle Creek Basin	1.7		14.91	39.47			286.68
KY5070203-017	Levisa Fork Minor Tribs			1.38	4.57			142.33
KY5070203-018	Beaver Creek Mainstem			2.42	1.46			
KY5070203-019	Right Fork Beaver Creek Basin	2.19	4.65	7.2	22.24			
KY5070203-020	Left Fork Beaver Creek Basin	12.09	1.08	9.7	24.56			
KY5070203-021	Mud Creek Basin	32.3		13.36	42.41	87.04		422.3
KY5070203-022 KY5070203-023	Mud Creek Basin Levisa Fork Minor Tribs	0.71	1.35	11.84	26.07	23.92		204.3
KY5070204-001 KY5070204-002	Big Sandy River Mainstem Big Sandy River Minor Tribs	30.6		15.85	61.71			541.87
KY5070204-003 KY5070204-005L01 KY5070204-006	Blaine Creek Mainstem Yatesville Lake Yatesville Lake Tribs	9.38	91.38	125.73	313.76	69.32		212.2
KY5070204-004	Cat Creek Basin		4.45	6.53	8.21			

APPENDIX C: CURRENT ESTIMATE OF WETLAND ACREAGE FOR KENTUCKY WATERBODIES

WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
Tygarts Creek Basin								
KY5090103-001 KY5090103-006	Tygarts Creek Mainstem Tygarts Creek Mainstem	33.84	12.29	45	81.62	1918.45		96.86
KY5090103-002	Schultz Creek Basin	21.48	2.85	5.1	18.58	13.78		24.58
KY5090103-003	White Oak Creek Basin	2.24			3.76			3.07
KY5090103-004	Tygarts Creek Minor Tribs	91.64	40.87	25.7	79.43	640.54		160.43
KY5090103-005	Buffalo Creek Basin	6.75		14.62	67.14			1.41
KY5090103-007 KY5090103-007L01	Tygarts Creek Minor Tribs Smokey Valley Lake			5.94	28.65	29.56		
KY5090103-008	Tygarts Creek Upper Basin	21.96	22.54	11.31	72.65	23.53		
Little Sandy Basin								
KY5090104-001	Little Sandy River Mainstem			4.9	12.9	180.62		
KY5090104-002 KY5090104-004 KY5090104-007 KY5090104-007L01	Little Sandy River Minor Tribs Little Sandy River Mainstem Little Sandy River Minor Tribs Greenbo Lake	1210.06	225.75	153.05	350.83	343.71	34.55	1405.04
KY5090104-003	East Fork Little Sandy River Basin	373.84	27.06	19.34	372.64			7.65
KY5090104-005	Little Fork Little Sandy Basin	54.49	9.18	32.43	109.2			
KY5090104-006	Big Sinking Creek Basin	2.52		2.21	28.21	7.03		
KY5090104-008L01 KY5090104-009 KY5090104-010	Grayson Lake Grayson Lake Tribs Little Sandy River Upper Basin		7.79	46.45	171.94	1494.3		

APPENDIX C: CURRENT ESTIMATE OF WETLAND ACREAGE FOR KENTUCKY WATERBODIES

WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5090104-010	Little Sandy River Upper Basin	5.02	2.36	9.73	153.83			
Ohio River Minor Tribs Basin								
KY5090201-001	Twelvemile Creek Basin	43.13	3.42	7.87	199.19	814.79	0.61	21.13
KY5090201-002	Locust Creek Basin	79.26	31.04	7.95	143.04	916.3		29.78
KY5090201-003	Bracken Creek Basin	38.74		2	56.11	1109.87		7.74
KY5090201-004	Lee Creek Basin	12.44	0.4	9.23	70.11	886.75		
KY5090201-005	Lawrence Creek Basin	37.41	14.87	20.88	122.85	2219.65		
KY5090201-006	Cabin Creek Basin	61.64	14	0.38	63.54	48.38		15.6
KY5090201-007	Crooked Creek Basin	23.58		23.42	7.63	1288.97		
KY5090201-008	Quicks Run Basin	11.41	2.09		3.41	18.97		
KY5090201-009	Salt Lick Creek Basin	23.19	5.2	1.93	9.92	14.23		
KY5090201-010 KY5090201-013 KY5090201-014	Kinniconick Creek Basin Kinniconick Creek Minor Tribs Ohio River Minor Tribs	230.87	71	23.74	90.22	4502.03		185.93
KY5090201-011	Laurel Fork Basin	96.23	5.11	7.91	17.05			
KY5090201-012	Indian Creek Basin	5.62	6.78		0.9			
KY5090201-014	Ohio River Minor Tribs	86.19	32.7	15.88	204.44	3361.54		14.9
KY5090203-001	Big Bone Creek Basin	126.07	31.37	21.97	485.02	52.23		14.8
KY5090203-002	Gunpowder Creek Basin	54.85	4.43	13.07	425.42	68.77	4.83	29.04
KY5090203-003	Woolper Creek Basin	20.63	2.48	3.29	202.87	16.65		62.26

APPENDIX C: CURRENT ESTIMATE OF WETLAND ACREAGE FOR KENTUCKY WATERBODIES

WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5090203-004	Ohio River Minor Tribs	1241.84	55.54	47.23	714.63	8903.35	45.83	6.81
Licking River Basin								
KY5100101-001 KY5100101-004 KY5100101-009	Licking River Mainstem Licking River Mainstem Licking River Minor Tribs	55.96	2.71	8.02	251.77	214.23	0.83	53.34
KY5100101-002 KY5100101-002L01	Banlick Creek Basin Doe Run Lake		2.16	14.25	252.85	178.12		44.45
KY5100101-003 KY5100101-009	Licking River Minor Tribs Licking River Minor Tribs	70.03	4.71	5.96	201.62	377.91		1.12
KY5100101-005	Cruises Creek Basin	8.47	21.93	6.16	137.89	72.28		0.66
KY5100101-006 KY5100101-006L01	Phillips Creek Basin A.J. Jolly Lake	24.16	2.14	7.22	128.8	192.23		1.21
KY5100101-007	Grassy Creek Basin	146.25	30.89	345.57	382.9	31.58		259.12
KY5100101-008 KY5100101-008L01	Kincaid Creek Basin Kincaid Lake	49.44	8.04	4.77	142.83	190.34		20.25
KY5100101-010 KY5100101-011	Licking River Mainstem Licking River Minor Tribs	73.89	18.59	9.96	205.77			575.03
KY5100101-012 KY5100101-013	North Fork Licking River Mainstem North Fork Licking River Minor Tribs	143.19	20.74	36	577.05			504
KY5100101-014	North Fork Licking River Upper Basin	54.77	7.49	4.57	84.63			
KY5100101-015 KY5100101-026	Licking River Mainstem Licking River Minor Tribs	136.45	20.6	62.45	469.81	0.05		1851.87
KY5100101-016	Beaver Creek Basin	42.88	4.86	0.29	48.68			36.92

APPENDIX C: CURRENT ESTIMATE OF WETLAND ACREAGE FOR KENTUCKY WATERBODIES

WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5100101-017	Johnson Creek Basin	39.36	0.59	12.94	139.74	0.68		
KY5100101-018	Fleming Creek Basin	72.13		5.79	227.1	53.09		2.26
KY5100101-019	Flat Creek Basin	16.72		3.82	75.71			2.32
KY5100101-020	Locust Creek Basin	40.51		1.89	44.86			12.51
KY5100101-021 KY5100101-021L01	Fox Creek Basin Sand Lick Creek Lake	23.4	8.73	14.56	174.27	154.48		3.66
KY5100101-022 KY5100101-022L01	Slate Creek Basin Greenbriar Lake	119.7	1.05	16.5	541.87	118.83		65.43
KY5100101-023	Salt Lick Creek Basin	57.45	6.7	21.73	53.73	57.96		8.5
KY5100101-024	Triplett Creek Basin	28.05	17.13	13.35	117.08			18.93
KY5100101-025	North Fork Triplett Creek Basin	140.93	7.57	18.05	110.14	23.77		
KY5100101-029	Beaver Creek Basin	22.16	44.95	136.25	53.9	2228.66	38.71	68.71
KY5100101-030	North Fork Licking River Basin	38.1	38.93	21.95	99.62	250.42	7.72	
KY5100101-031	Blackwater Creek Basin				124.07	95.7		
KY5100101-032	Grassy Creek Basin	10.39		0.74	57.82	27.59		
KY5100101-033 KY5100101-028L01	Cave Run Lake Tribs Cave Run Lake	1.96	12.51	52.27	66.64	4688.32	20.12	18.11
KY5100101-034 KY5100101-037	Licking River Mainstem Licking River Minor Tribs	38.88	42.09	96.11	248.48			1.24
KY5100101-035	Caney Creek Basin		9.15	17.38	24.76			
KY5100101-036	Elk Fork Basin	6.76	21.71	39.06	89.52			

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WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5100101-038	Burning Fork/State Road Fork Basin			2.54	34.68			
KY5100102-001 KY5100102-007 KY5100102-008 KY5100102-009 KY5100102-010 KY5100102-019 KY5100102-021 KY5100102-022 KY5100102-024	South Fork Licking River Mainstem South Fork Licking River Minor Tribs South Fork Licking River Mainstem South Fork Licking River Minor Tribs South Fork Licking River Mainstem Hinston Creek Mainstem Hinston Creek Mainstem Hinkston Creek Minor Tribs Hinkston Creek Minor Tribs	155.71	20.55	28	768.45	50.73		546.89
KY5100102-002	Fork Lick Creek Basin	31.16	4.03	8.68	151.97			77.29
KY5100102-003	Crooked Creek Basin	4.24	3.85	9.87	111.86			8.89
KY5100102-004	Raven Creek Basin	15.73	0.96	5.93	128.67	32.57		72.79
KY5100102-005	Twin Creek Basin	23.33	0.73	3.94	126.06	69		53.01
KY5100102-006	Mill Creek Basin	3.2		2.46	142.38	9.6		11.32
KY5100102-009	South Fork Licking River Minor Tribs	17.89		9.01	153.27	157.42		243.47
KY5100102-011	Townsend Creek Basin	12.58		18.2	166.16			11.52
KY5100102-014	Stoner Creek Minor Tribs	7.28	4.52	2.6	81.64			247.47
KY5100102-017	Strodes Creek Basin	7.62	6.04	23.11	548.04			16.4
KY5100102-016	Stoner Creek Minor Tribs			2.61	85.13			187.02

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WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5100102-012 KY5100102-014 KY5100102-015 KY5100102-018 KY5100102-022	Stoner Creek Mainstem Stoner Creek Minor Tribs Stoner Creek Mainstem Stoner Creek Mainstem Hinkston Creek Minor Tribs		0.11	34.8	729.38			153.25
KY5100102-023	Grassy Lick Creek Basin	1.3		6.23	183.98			
KY5100102-020 KY5100102-020L01	Big Brush Creek Basin Lake Carnico				110.53	120.33		
Kentucky River Basin								
KY5100201-001 KY5100201-003	North Fork Kentucky River Mainstem North Fork Kentucky River Minor Tribs			6.23	198.25	108.63		263.81
KY5100201-002 KY5100201-005	North Fork Kentucky River Mainstem North Fork Kentucky River Mainstem			1.19	41.98	13.8		316.84
KY5100201-004	Frozen Creek Basin	3.46		4.98	23.67			
KY5100201-005 KY5100201-006 KY5100201-010 KY5100201-011	North Fork Kentucky River Mainstem North Fork Kentucky River Minor Tribs North Fork Kentucky River Mainstem North Fork Kentucky River Minor Tribs	40.71	1.17	47.47	111.87	9.61		837.21
KY5100201-005L01 KY5100201-010 KY5100201-011	Pan Bowl Lake North Fork Kentucky River Mainstem North Fork Kentucky River Minor Tribs	50.58	8.84	17.12	75.67	94.21		476.09
KY5100201-007	Quicksand Creek Basin	10.79	18.55	31.85	283.68			
KY5100201-009	Troublesome Creek Basin	4.08		39.27	247.76			225.08
KY5100201-013	Lotts Creek Basin			14.86	16			

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WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5100201-014 KY5100201-015L01 KY5100201-016 KY5100201-017 KY5100201-020	Carr Fork Tailwaters Carr Fork Lake Carr Fork Lake Tributaries North Fork Kentucky River Mainstem North Fork Kentucky River Minor Tribs		22.1	20.68	76.06	536.42		285.41
KY5100201-018	Leatherwood Creek Basin			12	28.31			3.2
KY5100201-019	Line Creek Basin	1.75	5.81		15.57			12.26
KY5100201-021	Rockhouse Creek Basin	0.87	0.68	4	48.49			
KY5100201-022	North Fork Kentucky River Headwaters	0.74	3.68	8.88	52.15	32.67		47.46
KY5100202-001 KY5100202-002 KY5100202-004 KY5100202-007	Middle Fork Kentucky River Mainstem Middle Fork Kentucky River Minor Tribs Middle Fork Kentucky River Mainstem Middle Fork Kentucky Minor Mainstem	23.78	23.58	19.15	78.51	476.27	45.85	80.22
KY5100202-002 KY5100202-003L01 KY5100202-005 KY5100202-008	Middle Fork Kentucky River Minor Tribs Buckhorn Lake Middle Fork Kentucky River Minor Tribs Middle Fork Kentucky River Minor Tribs	38.97	28.21	30.32	66.89	915.11	40.51	235.93
KY5100202-006	Cutshin Creek Basin	9.14	6.4	20.83	82.52			
KY5100202-009	Greasy Creek Basin	2.65	10.38	5.18	60.59			
KY5100202-010	Middle Fork Kentucky River Headwaters			6	58.48			
KY5100203-001 KY5100203-005	South Fork Kentucky River Mainstem South Fork Kentucky River Minor Tribs	11.43	10.2	1.57	61.13	41.59		297.57
KY5100203-002	Sexton Creek Basin	5.47	0.9	6.94	90.6			21.56
KY5100203-003	Buffalo Creek Basin	3.25		3.07	25.73			

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WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5100203-004	Bullskin Creek Basin	1.84		0.93	8.1			
KY5100203-005	South Fork Kentucky River Minor Tribs	9.35	9.22	3.38	114.89	52.94		478.1
KY5100203-006	Goose Creek Mainstem		9.54		72.21			
KY5100203-007	Little Goose Creek Basin	1.51	0.74	10.93	203.8			
KY5100203-008	Goose Creek Minor Tribs	3.08	0.44	5.82	21.14			
KY5100203-008L01 KY5100203-010 KY5100203-011 KY5100203-012	Bert Combs Lake Goose Creek Headwaters Red Bird River Mainstem Red Bird River Minor Tribs	115.81	24.16	19.71	121.29	38.04		110.48
KY5100203-009	Collins Fork Basin	11.84	22.62	9.88	24.38			
KY5100204-001 KY5100204-008 KY5100204-013 KY5100204-015 KY5100204-017	Kentucky River Mainstem Kentucky River Mainstem Red River Mainstem Hardwick Creek Basin Red River Minor Tribs	125.61	103.25	73.72	202.64	459.22		152.36
KY5100204-002	Drowning Creek Basin	19.6	7.06	0.65	88.45			
KY5100204-003 KY5100204-005	Station Camp Creek Mainstem Station Camp Creek Minor Tribs	103.26	58.19	52.55	112.4	634.28		22.05
KY5100204-004	Red Lick Creek Basin	20.89	4.67	3.21	57.54	174.11		0.12
KY5100204-006	South Fork Station Camp Creek Basin	56.77	2.54	13.24	27.8			
KY5100204-007	War Fork Station	15.89			36.38			
KY5100204-009	Millers Creek Basin	47.95	10.47	15.92	85.63	61.14		

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WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5100204-010	Kentucky River Mainstem	10.48	6.44	10.21	40.29	670.69		
KY5100204-011	Sturgeon Creek Basin	73.86	3.75	15.12	236.31			
KY5100204-012	Kentucky River Minor Tribs	45.01	4.55	15.84	43.38	385.88		
KY5100204-013	Red River Mainstem	49.76	13.66	29.95	79.05			319.34
KY5100204-014	Lulbegrud Creek Basin	9.78	0.5	2.26	188.37			0.05
KY5100204-016	Cane Creek Basin	2.1		0.6	4.85			25.69
KY5100204-019 KY5100204-024	Red River Mainstem Red River Minor Tribs	7.56	6.3	2.61	22.53			38
KY5100204-020	Indian Creek Basin			1.46	15.25			
KY5100204-021	Gladie Creek Basin				26.65			
KY5100204-022 KY5100204-022L01	Swift Camp Creek Basin Campton Lake				54			
KY5100204-023	Stillwater Creek Basin				29.31			
KY5100204-025	Red River Headwaters	59.13	13.9	9.63	28.43			
KY5100205-001 KY5100205-002 KY5100205-002L01 KY5100205-003	Kentucky River Mainstem Kentucky River Minor Tribs General Butler State Park Lake Eagle Creek Mainstem	36.79	5.1	7.64	263.98	29.55		173.54
KY5100205-002	Kentucky River Minor Tribs	19.05	3.79	18.83	198.92	649.04	0.23	0.26
KY5100205-003 KY5100205-008 KY5100205-017	Eagle Creek Mainstem Eagle Creek Minor Tribs Kentucky River Minor Tribs	113.15	10.9	11.43	414.25	85.34		394.46

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WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5100205-004 KY5100205-004L01 KY5100205-004L02	Ten Mile Creek Basin Bullock Pen Lake Boltz Lake	10.07	6.23	17.95	234.59	256.51	1.59	20.71
KY5100205-005 KY5100205-008 KY5100205-008L01	Eagle Creek Mainstem Eagle Creek Minor Tribs Corinth Lake	1.68	1.65	1.78	158.75	92.02		32.66
KY5100205-006	Clarks Creek Basin	3.53	0.5	4.63	81.17			6.49
KY5100205-007	Stevens Creek Basin	18.95	1.75	1.92	115.73			85.08
KY5100205-008	Eagle Creek Minor Tribs	49.58	5.27	7.89	64.05	184.89		184.66
KY5100205-009	Lytles Fork Basin	18.04			69.9			4.74
KY5100205-010	Eagle Creek Headwaters	51.11	1.23	2.11	157.29			0.51
KY5100205-011	Kentucky River Mainstem	15.09	1.16	3.66	56.93	278.48		
KY5100205-012	Big Twin Creek Basin	2.15	9.53	2.33	168.34	4.08		9.19
KY5100205-013	Drennon Creek Basin	9.47	2.83	32.4	627.36	41.24		54.13
KY5100205-014	Sixmile Creek Basin	18.67	12.11	10.07	241.08	148.24		79.97
KY5100205-015 KY5100205-015L01	Severn Creek Basin Elmer Davis Lake	75.25	3.8	1.19	71.98	155.94		0.77
KY5100205-016	Cedar Creek Basin	83.61	26.96	0.85	41.55			
KY5100205-017	Kentucky River Minor Tribs	51.12	3.44	8.57	166.11	907.08	1.99	

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WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5100205-018 KY5100205-019 KY5100205-020 KY5100205-022 KY5100205-023 KY5100205-024 KY5100205-025	Elkhorn Creek Mainstem North Elkhorn Creek Mainstem North Elkhorn Creek Minor Tribs North Elkhorn Creek Mainstem North Elkhorn Creek Minor Tribs North Elkhorn Creek Mainstem North Elkhorn Creek Minor Tribs	88.07	5.76	80.81	1121.08	74.22		139.89
KY5100205-021	Cane Run Basin		0.37	13.45	121.67			
KY5100205-026 KY5100205-029 KY5100205-030 KY5100205-033 KY5100205-036	South Elkhorn Creek Mainstem South Elkhorn Creek Mainstem South Elkhorn Creek Minor Tribs Kentucky River Mainstem Kentucky River Minor Tribs	100.34	23.72	38.33	625.97	219.47		109.6
KY5100205-027	Lee Branch Basin	12.78	52.1	16.94	77.63			
KY5100205-028	Town Branch Basin			1.92	37.1			
KY5100205-031 KY5100205-033	Kentucky River Mainstem Kentucky River Mainstem	195.26	91.74	64.08	170.55	282.93		50.69
KY5100205-032	Benson Creek Basin	89.72	6.64	14.97	434.22	17.16		30.44
KY5100205-033 KY5100205-036 KY5100205-040	Kentucky River Mainstem Kentucky River Minor Tribs Herrington Lake Minor Tribs	6.31	2.62	73.78	398.33	3003.55	20.08	15.16
KY5100205-034	Glenns Creek Basin	6.43		5.89	117.24			
KY5100205-035	Clear Creek Basin	64.78	62.74	26.61	244.85			10.37

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WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5100205-038L01 KY5100205-040 KY5100205-041 KY5100205-043 KY5100205-044	Herrington Lake Herrington Lake Minor Tribs Dix River Mainstem Dix River Mainstem Dix River Minor Tribs	89.71	14.45	32.87	607.64	1446.12	1.57	23.1
KY5100205-039	Clarks Run Basin	3.38	10.33	5.18	94.19	56.27		2.21
KY5100205-042	Hanging Fork Basin	35.44	7.28	18.01	288.97	34.41		1.8
KY5100205-045	Cooper Creek Basin	64.46	12.01	5.93	38.13	9.5		
KY5100205-046	Dix River Headwaters	125.72	36.3	29.4	60.16			13.25
KY5100205-047	Kentucky River Mainstem	10.74	18.12	16.3	292.87	1311.48	2.33	26.89
KY5100205-048	Jessamine Creek Basin	1.69	0.55	18.17	134.82	96.72		
KY5100205-049	Hickman Creek Basin	151.12	27	27.44	375.86	438.39		1.37
KY5100205-050	Sugar Creek Basin	7.28		3.03	170.79			
KY5100205-051	Paint Lick Creek Basin	110.89	22.21	25.77	484.86	4.23		17.46
KY5100205-052 KY5100205-052L01	Silver Creek Basin Wilgreen Lake	146.5	36.47	28.27	584.93	217.76		18.04
KY5100205-053	Tate Creek Basin	3.36	4.57	8.92	195.84			2
KY5100205-054	Boone Creek Basin	26.3	27.89	16.62	213.97	55.62		
KY5100205-055	Otter Creek Basin	32.01	15.92	22.33	425.15	49.05	48.02	25.53
KY5100205-056	Fourmile Creek Basin	6.7	9.58	0.1	108.38	21.76		
KY5100205-057	Upper Howard Creek Basin	46.51	28.63	23.55	273.78	163.29		1.82

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WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5100205-059	Kentucky River Minor Tribs	46.51	28.63	23.55	273.78	163.29		1.82
Green River Basin								
KY5110001-011	Green River Mainstem	338.93	47.39	256.13	1061.51	99.4	131.62	635.76
KY5110001-002	Little Reedy Creek Basin	180.83	17.61	17.36	161.02	326.78		2.48
KY5110001-003	Big Reedy Creek Basin	198.16	18.6	46.7	84.21	74.01	2.38	0.17
KY5110001-004	Bear Creek Basin	219.49	16.8	52.5	474.41	45.43	11.66	265.38
KY5110001-005	Green River Minor Tribs	206.82	45.72	97.57	629.62	1362.93	2510.16	420.91
KY5110001-008	Nolin River Lake Tribs	54.52	8.8	32.12	326.14	191.95		870
KY5110001-009	Bacon Creek Basin	65.57	13.09	28.9	268.4			
KY5110001-010 KY5110001-011 KY5110001-018	Nolin River Mainstem Nolin River Minor Tribs Green River Mainstem	1187.64	195.55	308.85	1922.07	22.96		349.27
KY5110001-012	Valley Creek Basin	295.49	40.1	57.06	275.58	297.17		82.66
KY5110001-014	Middle Creek Basin	18.36	6.96	41.16	189.8	12.5		
KY5110001-016	North Fork Nolin River Basin	24.46	1.98	25.49	259.17	107.04		
KY5110001-017	South Fork Nolin River Basin	207.49	47.65	95.53	354.92	41.51	1.19	
KY5110001-019	Lynn Camp Creek Basin	36.85	3.11	7	106.45			1.01

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WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5110001-020 KY5110001-021 KY5110001-024 KY5110001-027 KY5110001-028 KY5110001-031 KY5110001-032 KY5110001-036 KY5110001-037 KY5110001-041	Little Barren River Mainstem Little Barren River Minor Tribs Green River Mainstem Russell Creek Mainstem Russell Creek Minor Tribs Green River Minor Tribs Green River Mainstem Green River Lake Minor Tribs Green River Mainstem Green River Minor Tribs	1383.3	371.3	168.7	652	3282.86	181.83	791.72
KY5110001-022	South Fork Little Barren River Basin	32.35		12.05	212.83	20.73		132.52
KY5110001-023	East Fork Little Barren River Basin	39.69	5.56	3.61	68.32			5.85
KY5110001-025	Big Brush Creek Basin	318.97	52.07	88.03	295.97			14.01
KY5110001-026	Big Pitman Creek Basin	2.04	1.31	14.02	257.11	54.55		8.46
KY5110001-029	Sulphur Creek Basin	156.7	20.7	6.82	59.18			1.37
KY5110001-030	Russell Creek Headwaters	132.55	7.75	10.89	142.98			1.85
KY5110001-034	Robinson Creek Basin	233.84	7.48	31	164.3	155.03	70.14	31.52
KY5110001-038	Goose Creek Basin	82.75	40.58	4.07	65.72			27.36
KY5110001-039	South Fork Basin	96.24	29.54	29.48	54.52			5.25
KY5110001-040	Brush Creek Basin	81.21	7.2	1.29	42.68			18.38
KY5110001-042	Green River Headwaters	105.11	13.75	17.25	182.9	81		44.48

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WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5110002-001 KY5110002-002 KY5110002-004 KY5110002-005 KY5110002-006	Barren River Mainstem Little Muddy Creek Basin Barren River Mainstem Barren River Minor Tribs Drakes Creek Mainstem	966.06	43.97	230.9	954.13	1056.07		447.05
KY5110002-003	Gasper River Basin	110.03	18.44	41.6	604.28	26.09		249.84
KY5110002-007	West Fork Drakes Creek Basin	113.31	20.32	34.49	426.36	17.8		438.03
KY5110002-008	Middle Fork Drakes Creek Basin	9.72		14.25	198.94			236.3
KY5110002-009	Trammel Creek Basin	8.01	4.59	5.04	252.53			383.29
KY5110002-010	Barren River Mainstem	1288.03	132.57	173.19	1632.62	1094.14	9.66	396.78
KY5110002-011	Bays Fork Basin	40.57	0.39	13.44	333.8			8.91
KY5110002-012 KY5110002-013L01 KY5110002-017 KY5110002-018 KY5110002-019 KY5110002-021 KY5110002-023 KY5110002-024	Barren River Minor Tribs Barren River Lake Long Creek Basin Barren River Lake Minor Tribs Barren River Mainstem Salt Lick Creek Basin Line Creek Basin Barren River Minor Tribs	273.63	144	54.94	524.54	8717.27	34.93	273.1
KY5110002-014	Beaver Creek Basin	88.32	10.12	29.79	439.17	9.34	0.45	34.49
KY5110002-015	Skaggs Creek Basin	53.48	2.97	37.43	690.92			10.48
KY5110002-016	Peter Creek Basin	19.27	3.17	22.2	176.58	26.98		
KY5110002-020	Indian Creek Basin			1.96	52.11			0.41

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WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5110002-022 KY5110002-022L01	East Fork Barren River Basin Mill Creek Lake	9.51	1.12	17.58	251.91	112.86		0.66
KY5110003-001 KY5110003-004 KY5110003-005 KY5110003-009 KY5110003-013	Green River Mainstem Green River Minor Tribs Mud River Mainstem Green River Mainstem Green River Minor Tribs	5024.11	548.72	585.61	2193.33	3228.55	395.39	660.34
KY5110003-002	Lewis Creek Basin	·683.58	201.11	31.27	211.95	1.4		
KY5110003-003	Pond Creek Basin	4388.88	548.18	509.86	1168.42	187.74	115.84	37.45
KY5110003-006	Rocky Creek Basin	568.31	58.83	9.65	132.6	810.93		16.11
KY5110003-007	Wolf Lick Creek Basin	958.25	106.2	56.93	331.69	541.71		150.63
KY5110003-008	Mud River Headwaters	103.41	8.47	32.49	288.66	82.51		
KY5110003-010	Muddy Creek Basin	495.02	95.42	24.89	258.96	254.51		25.08
KY5110003-011	Indian Camp Creek Basin	140.94	26.36	26.67	191.92			
KY5110003-012	Welch Creek Basin	106.12	41.89	24.31	139.87	14.95		
KY5110004-001 KY5110004-003	Rough River Mainstem Rough River Minor Tribs	2815.6	152.47	46.15	513.02	15.39	25.92	518.24
KY5110004-002	Barnett Creek Basin	745.76	20.6	6.5	142.2			12.9
KY5110004-004	Muddy Creek Basin	812.54	234.55	25.72	322.3			0.24
KY5110004-005 KY5110004-007	Rough River Mainstem Rough River Minor Tribs	568.8	309.35	26.54	143.55	46.55	1.96	116.26
KY5110004-006	Adams Fork Basin	253	27.77	18.81	110.42			31.42

APPENDIX C: CURRENT ESTIMATE OF WETLAND ACREAGE FOR KENTUCKY WATERBODIES

WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5110004-008	Caney Creek Basin	812.53	234.55	23.32	322.31			0.24
KY5110004-009	Rough River Mainstem	24.43	0.82	8.75	17.3			100.55
KY5110004-010	Spring Fork Basin	16.26	4.81	12.43	159.58	14.96		3.98
KY5110004-011	Rock Lick Creek Basin	45.35	27.42	14.77	103.52			25.75
KY5110004-012	Rough River Minor Tribs	147.97	26.5	22.66	66.38			254.49
KY5110004-014	North Fork Rough River Basin	16.9	14.98	21.67	403.68	359.44	212.68	
KY5110004-015	Clifty Creek Basin	1.22	6.5	8.56	141.59		21.44	
KY5110004-016	Meeting Creek Basin	8.65	4.34	1.29	103.54			
KY5110004-017	Rough River Lake Tribs	115.67	45.12	23.47	198.67	412.61	364.3	116.58
KY5110004-018 KY5110004-013L01	Rough River Headwaters Rough River Lake	23.83	26.64	66.12	478.97	2463.1	1528.79	
KY5110005-001 KY5110005-003 KY5110005-005 KY5110005-006	Green River Mainstem Green River Mainstem Green River Minor Tribs Panther Creek Mainstem	2414.5	207.84	374.75	278.4	13.19	39	326.37
KY5110005-002	Green River Minor Tribs	1025.05	79.67	25.36	138.65	12.09		217.71
KY5110005-004	Lick Creek Basin	477.96	42.83	10.55	177.87			82.46
KY5110005-007	Knoblick Creek Basin	170.93	19.3	15.43	458.43			6.18
KY5110005-008	Rhodes Creek Basin	864.83	18.39	49.67	73.58			3.44
KY5110005-009	North Fork Panther Creek Basin	1641.5	49.16	28.2	495.19	1.35		
KY5110005-010	South Fork Panther Creek Basin	2352.2	51.2	242.23	587.49	39.8		80.14

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WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5110005-011	Green River Mainstem	2039.6	224.33	181.93	539.8			743.16
KY5110005-012	Deer Creek Basin	3270.67	122.13	122.4	488.71			83.02
KY5110005-013	Green River Minor Tribs	1835.33	50.39	107.69	452.03	34.34		1000.37
KY5110005-014	Green River Mainstem	694.61	12.49	172.6	38.81			386.62
KY5110005-015	Long Falls Creek Basin	650.64	11.28	12.63	336.02			
KY5110005-016	Buck Creek Basin	260.83	19.8	17.78	93.48			
KY5110006-001	Pond River Mainstem	9536.34	241.24	426.4	1421	87.4		374.72
KY5110006-002	Cypress Creek Basin	4836.5	230.05	1553.45	1162.4	149.63	140.02	64.26
KY5110006-003	Otter Creek Basin	1211.34	11.44	11.37	85.94	28.62		22.95
KY5110006-004	Elk Creek Basin	1860.44	49.51	6.46	82			121.62
KY5110006-005	Flat Creek Basin	2660.38	347.52	227.13	1087.65			6.45
KY5110006-006	Drakes Creek Basin	4255.73	168.16	183.55	308.42	41.36	71.97	11.55
KY5110006-007	Pond River Minor Tribs	356.38	35	3.87	21.76			98.47
KY5110006-008	West Fork Pond River Basin	2314.96	43.7	40	276.45	76.41	3.73	106.4
KY5110006-009 KY5110006-011	Pond River Mainstem Pond River Minor Tribs	487.75	38.08	20.8	102.36	83.98	1.34	48.55
KY5110006-010	Long Creek Basin	356.74	9.9	6.11	132.4	31.75		22.76
KY5110006-012	Buck Fork Basin	373.05	58.65	14.87	131.47	121.51	13.88	
KY5110006-013	Pond River Headwaters	140.17	5.03	4.16	76.98	75.67	40.62	25.06

Upper Cumberland River Basin

APPENDIX C: CURRENT ESTIMATE OF WETLAND ACREAGE FOR KENTUCKY WATERBODIES

WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5130101-001	Lake Cumberland Minor Tribs	6.69		0.35	46.46	315.66		221.67
KY5130101-002 KY5130101-003L01 KY5130101-004 KY5130101-006 KY5130101-006L01 KY5130101-009	Laurel River Mainstem Laurel River Lake Tribs Laurel River Lake Laurel River (Corbin Reservoir) Mainstem Corbin City Reservoir Cumberland River Mainstem	380.63	72.75	34.27	423.14	6145.08	23.91	1010.4
KY5130101-005	Lynn Camp Creek Basin	714.4	119.36	37.23	248			12
KY5130101-007	Little Laurel River Basin	274.39	132.54	17.81	183.83	25.91		
KY5130101-008	Laurel River Basin	1329.01	62.02	152	420.94	7.48		
KY5130101-010	Indian Creek Basin		1.55	0.44	36.47			10.73
KY5130101-011 KY5130101-011L01	Marsh Creek Basin Laurel Creek Lake	189.88	206.7	17.52	139.24	30.14	4.39	42.11
KY5130101-012	Jellico Creek Basin	82.51	23.22	4.33	148.41			205.4
KY5130101-013	Watts Creek Basin	88.75	13.85	11.75	120.09			
KY5130101-009 KY5130101-016	Cumberland River Mainstem Clear Fork Minor Tribs	83.18	26.48	3.65	109.27			441.9
KY5130101-015 KY5130101-016 KY5130101-019 KY5130101-024	Clear Fork Mainstem Clear Fork Minor Tribs Cumberland River Mainstem Cumberland River Minor Tribs	184.37	93.08	58.48	256.82			274
KY5130101-025 KY5130101-032 KY5130101-035	Cumberland River Mainstem Cumberland River Mainstem Cumberland River Minor Tribs	181.24	23.58	31.94	89.29	5.86		964.02

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WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5130101-017	Laurel Fork Basin	16.18		12.62	13.82			
KY5130101-018	Clear Fork Headwaters	7.25			10.54			4.59
KY5130101-020	Popular Creek Basin	35.52	6.98	24.85	47.97			
KY5130101-021	Meadow Creek Basin	107.23	75.88	12.8	71.05			8.01
KY5130101-022	Big Indian Creek Basin	98.33	45.55	22	67.07			13.6
KY5130101-023	Richland Creek Basin	212.96	60.17	37.26	70.17			23.26
KY5130101-026	Brush Creek Basin	6.37	15.23	6.62	7.55			
KY5130101-027	Stinking Creek Basin	49.96	30.08	76.86	54.17			5.28
KY5130101-028	Greasy Creek Basin	1.41	10.11	5.49	5.46	2.93		4.45
KY5130101-029 KY5130101-029L01	Clear Creek Basin Chenoa Lake	27.98	18.2	15.56	51	32.2		8.07
KY5130101-030	Straight Creek Basin	33.66	4.49	13.36	77.08			
KY5130101-031 KY5130101-031L01	Yellow Creek Basin Cannon Creek Lake	113.94	17.06	7.08	54.13	302.95		42.62
KY5130101-033	Brownies Creek Basin	9.58		0.28	53.96			19.98
KY5130101-034	Puckett Creek Basin	2.04	5.4	2.31	6.68			
KY5130101-036	Poor Fork Basin	30.37	11.76	27.23	66.75			279.14
KY5130101-037	Clover Fork Basin	8.92	2.61	7.54	20.65			128.26
KY5130101-038 KY5130101-038L01	Martins Fork Basin Martins Fork Lake	21.03	15.13	40.64	57.35	527.96		26.07

APPENDIX C: CURRENT ESTIMATE OF WETLAND ACREAGE FOR KENTUCKY WATERBODIES

WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5130102-001 KY5130102-008	Rockcastle River Mainstem Rockcastle River Mainstem	22.72	1.23	1.92	63.81	13.74	0.34	71.58
KY5130102-002	Cane Creek Basin				16.13	13.68		
KY5130102-003	Sinking Creek Basin	0.44		1.19	108.05	22.27		
KY5130102-004	Skegg Creek Basin	2.73	0.77	5.66	15.87			40.17
KY5130102-005 KY5130102-005L01	Little Rockcastle River Basin Wood Creek Lake	22.64	6.53	5.64	141.36	660.33		
KY5130102-006	Rockcastle River Minor Tribs	29.3	6.74	1.38	245.12	460.8		454.5
KY5130102-007 KY5130102-007L01	Roundstone Creek Basin Lake Lineville	95.11	48.56	50.27	141.71	351.06		
KY5130102-009	Horse Lick Creek Basin		5.37	0.26	45.66			0.87
KY5130102-010 KY5130102-010L01	Middle Fork Rockcastle River Basin Tyner Lake	4.39	5.37	4.61	225.59	78.29		
KY5130102-011	South Fork Rockcastle River Basin	134.68	37.07	20.77	589.29			
KY5130103-001	Kettle Creek Basin	1.52		0.45	4.74			
KY5130103-002 KY5130103-009 KY5130103-020	Cumberland River Mainstem Cumberland River Minor Tribs Lake Cumberland Minor Tribs	54.77	9.14	25.31	196.59	2091.58	7.52	1642.67
KY5130103-003	Sulfur Creek basin	7.51	1.54	1.36	22.36			47.31
KY5130103-004	Meshach Creek Basin	1.31	1.23	2.15	19.41			1.49
KY5130103-005	Harrowbone Creek Basin			0.66	56.64			94.68
KY5130103-006	Big Renox Creek Basin		0.54		12.42			23.51

APPENDIX C: CURRENT ESTIMATE OF WETLAND ACREAGE FOR KENTUCKY WATERBODIES

WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5130103-007	Bear Creek Basin		0.45	1.98	16.13			
KY5130103-008	Crocus Creek Basin	4.98	0.34	5.03	62.04			37.48
KY5130103-010L01	Lake Cumberland	5.53	6.31	5.27	51.68	23284.95	10	
KY5130103-011	Big Lily Creek Basin	2.7		2.31	23.22	364.18		
KY5130103-012	Wolf Creek Basin	12.11	33.43	6.84	101.04	2075.38		1.23
KY5130103-013	White Oak Creek Basin	42.8	14.13	26.61	75.5	614.79		
KY5130103-014	Fishing Creek Basin	233.69	73.65	34.51	236.19	1370.08	12.12	79.87
KY5130103-015	Pitman Creek Basin	111.64	23.54	24.36	157.98	196.61	0.69	42.61
KY5130103-016	Buck Creek Basin	1145.2	366.35	206.98	437.88	453.05	3.31	174.13
KY5130103-017	Otter Creek Basin	136.62	39.4	36.71	101.6	1357.16		
KY5130103-018	Beaver Creek Basin	177.63	59.59	101.45	216.64	771.92		
KY5130103-019	Beaver Creek Basin			0.4	18.22	51.39		
KY5130103-020	Lake Cumberland Minor Tribs	412.64	25.21	72.65	360.29	5487.79	1.85	752.34
KY5130104-001 KY5130104-002 KY5130104-003 KY5130104-004 KY5130104-005 KY5130104-006 KY5130104-007 KY5130104-008 KY5130104-009	South Fork Cumberland River Mainstem Cedar Sinking Creek Basin Sinking Creek Basin Little South Fork Cumberland River Basin South Fork Cumberland River Minor Tribs South Fork Cumberland River Mainstem Rock Creek Basin Roaring Paunch Creek Basin Bear Creek Basin	49.75	15.13	24.52	235.06	2800.22		206.66

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WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5130105-001L01 KY5130105-002 KY5130105-003	Dale Hollow Lake Spring Creek Basin Dale Hollow Lake Minor Tribs	379.81	30	111	231.71	3793.47	231.19	66.58
Lower Cumberland River Basin								
KY5130205-001 KY5130205-005	Cumberland River Mainstem Cumberland River Minor Tribs	2750.23	143.35	229.83	320.54	5315.66	59.28	1415.76
KY5130205-002	Sandy Creek Basin	267.23	49.86	178.87	92.31			
KY5130205-003	Claylick Creek Basin	121.91	8.55	45.71	163.68	32.39	1.58	21.56
KY5130205-004	Livingston Creek Basin	196.65	41.45	132.98	698.6	32.6		3.67
KY5130205-006L01	Lake Barkley	271.12	447.24	156.69	17.29	27305.11	463.39	10.64
KY5130205-007	Eddy Creek Basin	284.04	73.87	131.83	495.23	40.41		
KY5130205-008	Little River Mainstem	966.61	120.3	158.37	485.76	197.42	27.4	134.76
KY5130205-009	North Fork Little River Basin	139.58	21.83	26.68	173.02	433.37		
KY5130205-009L01	Lake Blythe	14.37	3.27			163.14		
KY5130205-009L02	Lake Morris				1.02	34.95		
KY5130205-010	South Fork Little River Basin	686.37	42.97	52.16	123.68			
KY5130205-011	Sinking Fork	324.43	78.47	189.36	443.24	40.48		
KY5130205-012	Casey Creek Basin	209.73	28.62	47.64	75.45			4.92
KY5130205-013	Little River Minor Tribs	417.37	137.02	36	263.98	2695.9	58.17	54.79
KY5130205-014	Muddy Fork Basin	175.47	17.1	57.15	504.37	32.9		

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WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5130205-015	Donaldson Creek Basin	128.35	19.12	14.68	46.11			
KY5130205-016	Lake Barkley Minor Tribs	761.11	321.12	268.53	71.47	5157.75	183.47	30.21
KY5130206-001	West Fork Red River Basin	1251.54	78.51	159.3	253.33			
KY5130206-002	Elk Fork Basin	361.58	19.73	12.85	357.66	23		
KY5130206-003 KY5130206-005 KY5130206-008 KY5130206-009	Red River Mainstem South Fork Red River Basin Spring Creek Basin Noahs Spring Branch	3696.12	143.62	408.67	1066.78			569.95
KY5130206-004	Whippoorwill Creek Basin	491.12	84.25	62.29	412.7			274.8
KY5130206-006	Little Whippoorwill Creek Basin	449.31	43.48	76.96	303			4.49
KY5130206-007	Sulphur Spring Creek Basin	648.42	115.51	66.05	214.27			8.8
Ohio River Minor Tribs Basin								
KY5140101-001	Mill Creek Basin	236.8	7.93	132.96	109.23	960.17		9.45
KY5140101-002	Beargrass Creek Basin	17.44	1.27	23.82	78.79	196.71		
KY5140101-003	Goose Creek Basin	33.45	0.34	13.06	53.01	38.32		
KY5140101-004 KY5140101-004L01	Harrods Creek Basin Reformatory Lake	54.31	17.14	46.38	477.67	112.94		66.11
KY5140101-005	Corn Creek Basin	7.21	0.52	6.87	63.41	18.42		
KY5140101-006 KY5140101-006L01	Little Kentucky River Basin Jericho Lake	18.78	18.54	42.91	812.87	189.97		89.7
KY5140101-007	Ohio River Minor Tribs	38.82	11.76	64.54	532.89	3450.52	10.41	152.45

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WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
	Ohio River Mainstem	87.61	52.45	13.9	44.87	4249.01		
Salt River Basin								
KY5140102-001	Salt River Mainstem	177.81	5.13	4.38	5.26			83.78
KY5140102-002	Pond Creek Basin	623.01	49.24	156.91	372.85	38.79		31.8
KY5140102-003	Will Creek Basin	173.14	19.12	5.39	73.06	106.12	1.29	248.76
KY5140102-004 KY5140102-005 KY5140102-009	Salt River Minor Tribs Salt River Mainstem Floyds Fork Minor Tribs	175.75	49.91	13.95	259.61	109.61	17.62	281.85
KY5140102-006 KY5140102-019	Salt River Minor Tribs Salt River Minor Tribs	18.19	7.1	28.24	377.58	97.31		132.88
KY5140102-007 KY5140102-009 KY5140102-012 KY5140102-019	Floyds Fork Mainstem Floyds Fork Minor Tribs Floyds Fork Minor Tribs Salt River Minor Tribs	22.76	2.66	46.26	633.41	19.12		258.91
KY5140102-008 KY5140102-008L01	Cedar Creek Basin Lake McNeely	3.88		16.44	139.02	12.77		9.95
KY5140102-010	Chenoweth Run Basin	0.47	0.49	7.14	132.18			8.96
KY5140102-011 KY5140102-012L01	Floyds Fork Mainstem Long Run Park Lake	0.67	0.32	5.58	79.45	29		13.69
KY5140102-013	Currys Fork Basin	45.03	0.8	14.89	200	45		0.31
KY5140102-014	Floyds Fork Headwaters	3.93	0.3	25.62	258.87			38.59
KY5140102-015	Salt River Mainstem	4.5		0.85	33.27			112.61

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WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5140102-016	Cox Creek Basin	1.55	3.51	54.35	984.28	11.18		289.62
KY5140102-017	Plum Creek Basin	1.5	0.5	19	214.16			89.11
KY5140102-018	Simpson Creek Basin	51.76	7.75	12.69	280.37			28.98
KY5140102-019	Salt River Minor Tribs	28.93	1.26	19	219.75			426.44
KY5140102-020 KY5140102-024	Brashears Creek Mainstem Salt River Mainstem	8.28	4.57	8.18	80.86	288.86		116.57
KY5140102-021 KY5140102-021L01	Guist Creek Basin Guist Creek Lake	8.13	2.8	41.85	522.43	320.48		80.82
KY5140102-022 KY5140102-022L01	Clear Creek Basin Lake Shelby	6.87	3.5	39.02	332.55	64.11	1.01	117.29
KY5140102-023	Bullskin Creek Basin	6.98	3.26	60.36	517.18			94.82
KY5140102-026	Beech Creek Basin	3.9	0.21	35.7	243.98	111.95		35.04
KY5140102-027	Crooked Creek Basin	9.89		2.82	94.82	98.09		26.25
KY5140102-028 KY5140102-029 KY5140102-032	Taylorsville Lake Minor Tribs Salt River Mainstem Salt River Minor Tribs	195.82	8.41	12.91	633.41	561.66		122.77
KY5140102-028 KY5140102-025L01	Taylorsville Lake Minor Tribs Taylorsville Lake	238.54	4.03	8.53	68.11	1258.31	1.85	
KY5140102-030	Hammond Creek Basin	0.78			76.53			
KY5140102-031	Salt River Mainstem	18.33		16.81	157.76			11.3
KY5140102-033	Salt River Headwaters		0.51	12.34	245.96			
KY5140103-001	Rolling Fork Mainstem	13.2	13.76	2.25	33.59	7.41		34.86

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WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5140103-002	Crooked Creek Basin	26.01	1.47	3.53	83.14	30.88		52.54
KY5140103-003	Wilson Creek Basin	0.57		6.2	150.96	74.79		88.57
KY5140103-004 KY5140103-005 KY5140103-007	Rolling Fork Minor Tribs Rolling Fork Mainstem Rolling Fork Minor Tribs	143.16	40.1	33.74	499.75	56.09	0.25	1080.71
KY5140103-005	Rolling Fork Mainstem	10.02	0.85	8.86	239.37	7.66		251.56
KY5140103-005 KY5140103-007 KY5140103-007L01	Rolling Fork Mainstem Rolling Fork Minor Tribs Marion Co. Sportman Lake	56.07	1.16	12.59	486.72	30.35		419.63
KY5140103-006	Pottinger Creek Basin	0.2		10.48	244.18	66.29		2.3
KY5140103-008	North Rolling Fork Basin			1.21	125.97			215.31
KY5140103-009	Big South Fork Basin		1.14	2.97	50.51			55.7
KY5140103-010 KY5140103-011 KY5140103-011L01 KY5140103-012 KY5140103-015	Beech Fork Mainstem Beech Fork Minor Tribs Sympson Lake Beech Fork Mainstem Beech Fork Minor Tribs	30.57	17.61	33.55	473.4	191.66		1027.01
KY5140103-013	Hardins Creek Basin	2.08	0.33	11.54	303.42	6.38		150.02
KY5140103-014	Cartwright Creek Basin	2.81	1.52	14.88	561.13	46.83		201.88
KY5140103-016 KY5140103-018 KY5140103-019 KY5140103-023	Beech Fork Mainstem Beech Fork Minor Tribs Chaplin River Mainstem Chaplin River Minor Tribs	10.59	5.93	24.45	882.36			573.16

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WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5140103-017 KY5140103-017L01	Long Lick Creek Basin Willisburg Lake			2.14	235.46	131.12		137.36
KY5140103-019 KY5140103-023	Chaplin River Mainstem Chaplin River Minor Tribs	4.72	1.4	9.02	368.5			185.93
KY5140103-020	Glens Creek Basin			1.86	111.96			22.48
KY5140103-021 KY5140103-021L01	Beaver Creek Basin Beaver Lake	12.63			83.43	192.36		70
KY5140103-022	Sulfur Creek Basin	229.32		0.56	126.25			34.36
Ohio River Minor Tribs Basin								
KY5140104-001 KY5140104-005	Sinking Creek Mainstem Ohio River Minor Tribs	463.16	59.8	246.41	2091.75	8337.24		290.94
KY5140104-002	Sugar Tree Run Basin	6.56			72.48			
KY5140104-003	Hardins Creek Basin	19.79	19.12	4.81	144	50.6		
KY5140103-004	Otter Creek Basin	294.96	60.85	44.48	315.32	43.26		202.98
	Ohio River Mainstem	393.05	78.12	22.36	56.82	286.96		2.51
KY5140201-001	Pup Creek Basin	279.94	28.79	42.88	268.11	292.7	1.49	
KY5140201-002	Blackford Creek Basin	1470	204.76	264.21	311.46	97.12		37.06
KY5140201-003	Lead Creek Basin	59.1	1.72	2.12	67.53	54.84		
KY5140201-004	Clover Creek Basin	98.33	53.66	15.92	191.88	531.48		
KY5140201-005	Ohio River Minor Tribs	55	5.91	6.53	141.26	1620.59		
	Ohio River Mainstem	7306.19	487.86	781.6	1703.91	18770.41	72.11	23.34

APPENDIX C: CURRENT ESTIMATE OF WETLAND ACREAGE FOR KENTUCKY WATERBODIES

WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5140202-001	Lost Creek Basin	15.94	3.63	28.17	364.79			
KY5140202-002 KY5140202-005	Highland Creek Basin Highland Creek Minor Tribs	1146	186.15	179.93	818.93	19.29		241.77
KY5140202-003	Pond Creek Basin	6022.09	534.62	976.39	244.17			1.09
KY5140202-004	Casey Creek Basin	55.78	6.49	115.81	242.54			
KY5140202-006	Canoe Creek Basin	297.62	37.22	44.57	621.53	121.53		56.21
	Ohio River Mainstem	6869.07	317.01	754.96	1603.5	13841.61	2.25	23.34
KY5140203-001	Bayou Creek Basin	748.31	4.73	50.79	136.73	77.07		
KY5140203-002	Deer Creek Basin	593.05	31.06	91.21	132.86			39.01
KY5140203-003	Hurricane Creek Basin	264.14	82.9	11.1	146.15			25.87
KY5140203-004	Crooked Creek Basin	98.1	4.97	8.27	286.35	31.02	0.34	3.87
KY5140203-005	Dennis O'Nan/Cypress Creek Basin	242.29	0.38	40.69	259.34	2.53		34.33
KY5140203-006	Goose Pond Ditch	1203.39	1.45	80.84	159.23	49.13		
KY5140203-007	Ohio River Minor Tribs	3819.57	168.27	643.06	456.11	7680.86	58.87	53.22

APPENDIX C: CURRENT ESTIMATE OF WETLAND ACREAGE FOR KENTUCKY WATERBODIES

WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
Tradewater River Basin								
KY5140205-001 KY5140205-004 KY5140205-005 KY5140205-006 KY5140205-007 KY5140205-014L02	Tradewater River Mainstem Tradewater River Minor Tribs Tradewater River Mainstem Piney Creek Tradewater River Minor Tribs Pennyrile Lake	5169.55	527.34	66.6	444.78	35	2	578.02
KY5140205-002	Cypress Creek Basin	100.75	1.62	42.19	241.07	45.64		
KY5140205-003	Craborchard Creek Basin	2052.33	93.71	130.74	1084.29	103.08		86.09
KY5140205-008	Clear Creek Basin	9730.07	1528.39	1079.18	2910.22	714.55	40.19	
KY5140205-009 KY5140205-010 KY5140205-011 KY5140205-012	Tradewater River Mainstem Donaldson Creek Basin Flynn Fork Basin Tradewater River Mainstem	4742	794.86	141.04	499.16	3.25	19.31	
KY5140205-014 KY5140205-015 KY5140205-016 KY5140205-017	Piney Creek Caney Creek Basin Tradewater River Minor Tribs Tradewater River Headwaters	2813.33	435.66	129.02	715.94	1014.83	5.76	5.62
Ohio River Minor Tribs Basin								
KY5140206-001 KY5140206-001L01	Humphrey Creek Basin Turner Lake	5655.09	452.91	713.56	532.37	463.72	264.17	6470.2
KY5140206-002 KY5140206-005 KY5140206-006L01	Bayou Creek Basin Ohio River Minor Tribs Metropolis Lake	3918.35	484.87	343.59	356.78	8192.83	105.21	5.49
KY5140206-003	Massac Creek Basin	1376.17	77.7	70.65	333.27	153.84		48.18

APPENDIX C: CURRENT ESTIMATE OF WETLAND ACREAGE FOR KENTUCKY WATERBODIES

WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY5140206-004	Perkins Creek Basin	1669.29	98.89	73.91	143.07	5487.49	0.7	1.97
Tennessee River Basin								
KY6040005-001L01 KY6040005-002 KY6040005-003 KY6040005-004	Kentucky Lake Jonathan Creek Basin Blood River Basin Kentucky Lake Minor Tribs	5743.94	296.58	436.52	405.44	46311.35	1654.66	5.05
KY6040006-001 KY6040006-003 KY6040006-004 KY6040006-005 KY6040006-006 KY6040006-007 KY6040006-008 KY6040006-009 KY6040006-010 KY6040006-013	Tennessee River Mainstem Clarks River Mainstem Clarks River Mainstem Clarks River Minor Tribs Clarks River Mainstem Rockhouse Creek Basin Clarks River Minor Tribs East Fork Clarks River Basin Middle Fork Clarks River Basin Cypress Creek Basin	17451.19	820.16	522.73	1298.84	3571.03	45.98	649.56
KY6040006-002 KY6040006-011 KY6040006-012	Island Creek Basin West Fork Clarks River Mainstem West Fork Clarks River Tribs	10125.51	1032.7	408.89	555.05	979.63	101.99	330.68

APPENDIX C: CURRENT ESTIMATE OF WETLAND ACREAGE FOR KENTUCKY WATERBODIES

WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
Mississippi River Basin								
KY8010100-001 KY8010100-001L01 KY8010100-001L02 KY8010100-001L03 KY8010100-001L04 KY8010100-001L05 KY8010100-001L06 KY8010100-001L07 KY8010100-001L08 KY8010100-002 KY8010100-002L01 KY8010100-002L03	Shawnee Creek Basin Flat Lake Fish Lake Buck Lake Swan Pond Happy Hollow Lake Beaver Dam Lake Mitchell Lake Shelby Lake Minor Slough Basin Long Pond Burnt Pond	17110.01	2179.46	1732.3	722.14	770.6	304.6	17305.32
KY8010201-001 KY8010201-002	Mayfield Creek Mainstem Mayfield Creek Minor Tribs	3112.22	101.72	79.31	555.53	51.42		61.31
KY8010201-002 KY8010201-004 KY8010201-007	Mayfield Creek Minor Tribs Mayfield Creek Mainstem Mayfield Creek Minor Tribs	1099.73	35.36	8.44	181.35			
KY8010201-003	West Fork Mayfield Creek Basin	1527.82	68.08	126.8	973.13	1.55	15.38	23.29
KY8010201-005	Wilson Creek Basin	826.58	13.54	53.07	168.07			131.04
KY8010201-006	Brush Creek Basin	302.04	13.91	10.73	62.72			14.46
KY8010201-008 KY8010201-009	Little Mayfield Creek Basin Mayfield Creek Headwaters	5699.91	1167.57	615.41	2539.77			336.81
KY8010201-010	Obion Creek Mainstem	2657.34	43.22	51.46	60.06			73.24

APPENDIX C: CURRENT ESTIMATE OF WETLAND ACREAGE FOR KENTUCKY WATERBODIES

WATERBODY CODE	WATERBODY NAME	FO	SS	EM	OTH-P	L-1	L-2	R
KY8010201-010 KY8010201-013 KY8010201-014 KY8010201-015 KY8010201-016	Obion Creek Mainstem Cypress Creek Basin Obion Creek UT Obion Creek Minor Tribs Obion Creek Headwaters	10587.4	1023.56	356.48	734.12		69.9	7.8
KY8010201-011	Cane Creek Basin	218.12	22.66	8.25	169.05			
KY8010201-012	Little Creek Basin	403.65			160.47	31.71	1.89	
KY8010201-015	Obion Creek Minor Tribs	313.47	15.61	1.28	97.72			
KY8010201-017	Brush Creek Basin	672.86	42.28	38.95	143.46		21.21	
KY8010201-018	Bayou De Chien Mainstem	5986.26	859.82	261.18	303.52		40.98	78.16
KY8010201-019	Mud Creek Basin	751.2	42.02	10.08	60.72			11.5
KY8010201-020	Little Bayou De Chien Basin	2193.83	102.87	91.43	114.78			17.48
KY8010201-021	Cane Creek Basin	966.94	30.89	193.83	87.24			
KY8010202-001 KY8010202-002 KY8010202-003	Running Slough Powell Creek Basin Terrapin Creek Basin	2777.94	207.8	280.16	471.11	40.88		14.89

Legend:

FO = Palustrine Forested (PFO)
SS = Palustrine Scrub Shrub (PSS)
EM = Palustrine Emergent (PEM) and Aquatic Bed (PAB)
OTH-P = Other Palustrine: Unconsolidated Bottom (PUB), Unconsolidated Shore (PUS), and Open Water (POW)

L-1 = Lacustrine Limnetic
L-2 = Lacustrine Littoral
R = Riverine

APPENDIX D

LAKE INFORMATION AND EXPLANATORY CODES

Appendix D
Lake Information and Explanatory Codes

COLUMN HEADER	DEFINITION
LAKE NAME	the name of the waterbody as shown on USGS topographic map
TOTAL ACREAGE	size of lake at summer pool or normal seasonal levels
USGS QUADRANGLE	quadrangle where the dam or waterbody is located
LATITUDE\LONGITUDE	location of the dam by degrees, minutes, and seconds
WATERBODY SYSTEM NUMBER	a stream identification number assigned by the Division of Water
COUNTY NAME	the name of the county where the dam or lake is located
RIVER BASIN	the name of the major river basin in which the waterbody is located
SUBBASIN	the name of the waterbody that receives the discharge from the lake or reservoir

LAKE NAME	TOTAL ACRES	USGS QUADRANGLE	LATI-TUDE	LONGI-TUDE	WATERBODY SYSTEM NUMBER	COUNTY NAME	RIVER BASIN	SUBBASIN
A.J.JOLLY LAKE	204	ALEXANDRIA	38-52-59	84-22-27	KY5100101-006L01	CAMPBELL	LICKING	PHILLIPS CREEK
ARROWHEAD LAKE	37	CAIRO,ILL-KY	37-01-50	89-07-20	KY8010100-002L02	BALLARD	MISSISSIPPI	CYPRESS SLOUGH
BARREN RIVER LAKE	10000	LUCAS	36-55-34	86-02-28	KY5110002-013L01	BARREN\ALLEN	GREEN	BARREN RIVER
BEAVER LAKE	158	ASHBROOK	37-57-45	85-01-20	KY5140103-021L01	ANDERSON	SALT	BEAVER CREEK
BEAVER DAM LAKE	50	OLMSTEAD ILL-KY	37-09-04	89-02-32	KY8010100-001L06	BALLARD	OHIO	HUMPHREY CREEK
BERT COMBS LAKE	36	BARCREEK	37-10-00	83-42-27	KY5100203-008L01	CLAY	KENTUCKY	BEECH CREEK
BOLTZ LAKE	92	WILLIAMSTOWN	38-42-12	84-36-45	KY5100205-004L02	GRANT	KENTUCKY	ARNOLDS CREEK
BRIGGS LAKE	18	HOMER	36-53-21	86-49-49	KY5110003-008L01	LOGAN	GREEN	MUD RIVER
BUCK LAKE	19	BARLOW,KY-ILL	37-02-26	89-05-22	KY8010100-001L03	BALLARD	MISSISSIPPI	SHAWNEE CREEK
BUCKHORN LAKE	1230	BUCKHORN	37-18-16	83-26-54	KY5100202-003L01	PERRY\LESLIE	KENTUCKY	MIDDLE FK.KENTUCKY RIV
BULLOCK PEN LAKE	134	VERONA	38-47-36	84-38-41	KY5100205-004L01	GRANT	KENTUCKY	BULLOCK PEN CREEK
BURNT POND	10	BARLOW,KY-ILL	37-02-40	89-07-02	KY8010100-002L03	BALLARD	MISSISSIPPI	DEEP SLOUGH
CAMPBELLSVILLE CITY RES.	63	CAMPBELLSVILLE	37-21-31	85-20-17	KY5110001-026L01	TAYLOR	GREEN	TRACE FK, L. PITMAN CK
CAMPTON LAKE	26	CAMPTON	37-44-42	83-32-37	KY5100204-022L01	WOLFE	KENTUCKY	HIRAM BR, SWIFT CAMP CK
CANEYVILLE CITY RESERVOIR	75	CANEYVILLE	37-26-34	86-27-42	KY5110004-008L01	GRAYSON	GREEN	NF CANEY CREEK
CANNON CREEK LAKE	243	MIDDLESBORO NORTH	36-40-51	83-42-08	KY5130101-031L01	BELL	UPPER CUMBERLAND	CANNON CREEK
CARPENTER LAKE	64	MACEO	37-50-51	86-58-51	KY5140201-001L01	DAVIESS	OHIO	UT TO PUP CREEK
CARR FORK LAKE	710	VICCO	37-14-04	83-00-03	KY5100201-015L01	KNOTT\PERRY	KENTUCKY	CARR FORK, KENTUCKY RIV
CAVE RUN LAKE	8270	SALT LICK	38-03-03	83-29-42	KY5100101-028L01	ROWAN\BATH	LICKING	N\A
CHENOA LAKE	37	KAYJAY	36-40-33	83-51-07	KY5130101-029L01	BELL	UPPER CUMBERLAND	CLEAR CREEK
CORBIN CITY RESERVOIR	139	CORBIN	36-59-23	87-07-07	KY5130101-006L01	LAUREL	UPPER CUMBERLAND	LAUREL RIVER
CORINTH LAKE	96	MASON	38-30-00	84-34-56	KY5100205-008L01	GRANT	KENTUCKY	THREE FORKS CREEK
CRANKS CREEK LAKE	219	HUBBARD SPRINGS,VA	36-44-23	83-13-12	KY5130101-038L02	HARLAN	UPPER CUMBERLAND	CRANKS CREEK
DALE HOLLOW LAKE	4300	DALE HOLLOW DAM,TN	36-36-31	85-19-29	KY5130105-001L01	CUMBERLAND\CLINTON	UPPER CUMBERLAND	OBEY RIVER
DEWEY LAKE	1100	DEWEY LAKE	37-41-39	82-42-22	KY5070203-012L01	FLOYD	BIG SANDY	LEVISA FORK
DOE RUN LAKE	51	INDEPENDENCE	38-59-19	84-33-07	KY5100101-002L01	KENTON	LICKING	BULLOCK PEN CREEK
ELMER DAVIS LAKE	149	GRATZ	38-29-51	84-52-40	KY5100205-015L01	OWEN	KENTUCKY	NORTH SEVERN CREEK
ENERGY LAKE	370	MONT	36-51-30	88-01-26	KY5130205-016L01	TRIGG	LOWER CUMBERLAND	CROOKED CREEK
FISH LAKE	27	BARLOW,KY-ILL	37-03-00	89-05-30	KY8010100-001L02	BALLARD	MISSISSIPPI	SHAWNEE CREEK

LAKE NAME	TOTAL ACRES	USGS QUADRANGLE	LATI-TUDE	LONGI-TUDE	WATERBODY SYSTEM NUMBER	COUNTY NAME	RIVER BASIN	SUBBASIN
FISHPOND LAKE	32	JENKINS WEST	37-09-42	83-40-38	KY5100201-022L01	LETCHER	KENTUCKY	FISHPOND BRANCH
FISHTRAP LAKE	1143	MILLARD	37-25-39	82-22-12	KY5070202-008L01	PIKE	BIG SANDY	LEVISA FORK
FLAT LAKE	38	BARLOW,KY-ILL	37-02-30	89-05-57	KY8010100-001L01	BALLARD	MISSISSIPPI	UT TO SHAWNEE CREEK
FREEMAN LAKE	160	ELIZABETHTOWN	37-43-15	85-52-17	KY5110001-012L01	HARDIN	GREEN	FREEMAN CREEK
GENERAL BUTLER ST.PK. LAKE	29	CARROLLTON	38-40-04	85-08-54	KY5100205-002L01	CARROLL	KENTUCKY	UT TO KENTUCKY RIVER
GRAPEVINE LAKE	50	MADISONVILLE EAST	37-18-16	87-28-40	KY5110006-005L01	HOPKINS	GREEN	UT TO FLAT CREEK
GRAYSON LAKE	1512	GRAYSON	38-11-48	83-02-36	KY5090104-008L01	CARTER\ELLIOTT	LITTLE SANDY	N\A
GREENBRIAR LAKE	66	PRESTON	38-01-11	83-51-34	KY5100101-022L01	MONTGOMERY	LICKING	GREENBRIAR CREEK
GREENBO LAKE	181	ARGILLITE	38-29-19	85-52-04	KY5090104-007L01	GREENUP	LITTLE SANDY	CLAYLICK CREEK
GREEN RIVER LAKE	8210	CANE VALLEY	37-14-59	85-20-02	KY5110001-033L01	ADAIR\TAYLOR	GREEN	N\A
GUIST CREEK LAKE	317	SHELBYVILLE	38-12-28	85-08-31	KY5140102-021L01	SHELBY	SALT	GUIST CREEK
HAPPY HOLLOW LAKE	20	OLMSTEAD ILL-KY	37-00-28	89-01-48	KY8010100-001L05	BALLARD	OHIO	HUMPHREY CREEK
HEMATITE LAKE	90	MONT	36-53-44	88-02-53	KY5130205-016L03	TRIGG	LOWER CUMBERLAND	LONG CREEK
HERRINGTON LAKE	2940	WILMORE	37-44-45	84-42-14	KY5100205-038L01	MERCER\GARRARD	KENTUCKY	DIX RIVER
HONKER LAKE	190	MONT	36-54-22	88-01-47	KY5130205-016L02	TRIGG	LOWER CUMBERLAND	LONG CREEK
KENTUCKY LAKE	48100	GRAND RIVERS	36-29-52	88-02-42	KY6040005-001L01	MARSHALL\LIVINGSTON	TENNESSEE	N\A
KINCAID LAKE	183	FALMOUTH	38-42-57	84-16-36	KY5100101-008L01	PENDLETON	LICKING	KINCAID CREEK
KINGFISHER LAKE	30	MACEO	37-50-42	86-58-35	KY5140201-001L02	DAVIESS	OHIO	PUP CREEK
LAKE BARKLEY	45600	GRAND RIVERS	36-44-12	87-57-58	KY5130205-006L01	LIVINGSTON\LYON	LOWER CUMBERLAND	N\A
LAKE BESHEAR	760	DAWSON SPRINGS	37-08-28	87-40-57	KY5140205-014L01	CALDWELL\CHRISTIAN	TRADEWATER	PINEY CREEK
LAKE BLYTHE	89	KELLY	36-55-32	87-30-00	KY5130205-009L01	CHRISTIAN	LOWER CUMBERLAND	WHITE CREEK
LAKE CARNICO	114	CARLISLE	38-20-48	84-02-30	KY5100102-020L01	NICHOLAS	LICKING	BRUSHY CREEK
LAKE CUMBERLAND	50250	WOLF CREEK DAM	36-54-47	84-58-43	KY5130103-010L01	RUSSELL\CLINTON	UPPER CUMBERLAND	N\A
LAKE GEORGE	53	MARION	37-17-49	88-05-25	KY5140203-004L01	CRITTENDEN	OHIO	UT TO CROOKED CREEK
LAKE JERICHO	137	SMITHFIELD	38-27-07	85-16-56	KY5140101-006L01	HENRY	LITTLE KENTUCKY	N\A
LAKE LINVILLE	273	WILDIE	37-23-20	84-20-40	KY5130102-007L01	ROCKCASTLE	UPPER CUMBERLAND	RENFRO CREEK
LAKE MALONE	826	ROSEWOOD	37-04-19	87-02-20	KY5110003-006L01	MUHLENBERG	GREEN	ROCKY CREEK
LAKE MORRIS	170	KELLY	36-55-44	87-27-18	KY5130205-009L02	CHRISTIAN	LOWER CUMBERLAND	UPPER BRANCH, LITTLE RIV
LAKE PEWEE	360	MADISONVILLE WEST	37-21-09	87-31-40	KY5140205-008L01	HOPKINS	TRADEWATER	GREASY CREEK

LAKE NAME	TOTAL ACRES	USGS QUADRANGLE	LATI-TUDE	LONGI-TUDE	WATERBODY SYSTEM NUMBER	COUNTY NAME	RIVER BASIN	SUBBASIN
LAKE WASHBURN	26	DUNDEE	37-31-05	86-50-56	KY5110004-007L01	OHIO	GREEN	LICK BRANCH
LAUREL CREEK LAKE	88	WHITLEY CITY	36-41-18	84-26-35	KY5130101-011L01	MCCREARY	UPPER CUMBERLAND	LAUREL CREEK
LAUREL RIVER LAKE	6060	SAWYER	36-58-21	84-15-31	KY5130101-003L01	LAUREL\WHITLEY	UPPER CUMBERLAND	LAUREL RIVER
LEWISBURG LAKE	51	LEWISBURG	36-58-14	86-55-36	KY5110003-008L01	LOGAN	GREEN	AUSTIN CREEK
LIBERTY LAKE	79	LIBERTY	37-19-03	84-54-26	KY5110001-042L01	CASEY	GREEN	HICKMAN CREEK
LOCH MARY	135	MADISONVILLE WEST	37-16-06	87-31-22	KY5140205-008L02	HOPKINS	TRADEWATER	UT TO CLEAR CREEK
LONG POND	56	CAIRO,ILL-KY	37-01-15	89-07-40	KY8010100-002L01	BALLARD	MISSISSIPPI	CYPRESS SLOUGH
LONG RUN PARK LAKE	27	CRESTWOOD	38-16-01	85-25-05	KY5140102-012L01	JEFFERSON	SALT	LONG RUN
LUZERNE LAKE	55	GREENVILLE	37-12-42	87-11-54	KY5110003-003L01	MUHLENBERG	GREEN	UT TO CANEY CREEK
MARION COUNTY LAKE	21	LEBANON EAST	37-30-54	85-14-45	KY5140103-007L01	MARION	SALT	UT TO ROLLING FORK
MARTIN'S FORK LAKE	334	ROSE HILL, VA-KY	36-44-36	83-15-58	KY5130101-038L01	HARLAN	UPPER CUMBERLAND	MARTINS FORK
MAUZY LAKE	84	BORDLEY	37-37-08	87-51-26	KY5140202-004L01	UNION	OHIO	CASEY CREEK
MCNEELY LAKE	51	BROOKS	38-06-09	85-38-07	KY5140102-008L01	JEFFERSON	SALT	PENNSYLVANIA RUN
METCALFE COUNTY LAKE	22	EAST FORK	37-02-30	85-36-32	KY5110001-022L01	METCALFE	GREEN	SULPHUR CREEK
METROPOLIS LAKE	36	JOPPA,ILL-KY	37-08-52	88-46-00	KY5140206-006L01	MCCRACKEN	OHIO	FLOOD PLAIN LAKE
MILL CREEK L. (MONROE CO)	109	TOMPKINSVILLE	36-40-44	85-41-45	KY5110002-022L01	MONROE	GREEN	MILL CREEK
MILL CREEK L. (POWELL CO)	41	SLADE	37-46-07	83-40-06	KY5100204-018L01	POWELL	KENTUCKY	MILL CREEK
MITCHELL LAKE	58	OLMSTEAD ILL-KY	37-06-24	89-02-43	KY8010100-001L07	BALLARD	OHIO	HUMPHREY CREEK
MOFFIT LAKE	49	BORDLEY	37-34-41	87-51-10	KY5140205-002L01	UNION	TRADEWATER	DYSON CREEK
NOLIN RIVER LAKE	5790	NOLIN LAKE	37-20-10	86-10-55	KY5110001-007L01	EDMONSON	GREEN	NOLIN RIVER
PAINTSVILLE LAKE	1139	OIL SPRINGS	37-50-28	82-52-38	KY5050203-008L01	JOHNSON	BIG SANDY	LEVISA FORK
PANBOWL LAKE	98	JACKSON,QUICKSAND	37-34-30	82-22-31	KY5100201-005L01	BREATHITT	KENTUCKY	NF KENTUCKY RIVER
PENNYRILE LAKE	47	DAWSON SPRINGS SW	37-04-06	87-39-50	KY5140205-014L02	HOPKINS	TRADEWATER	CLIFTY CREEK
PROVIDENCE CITY LAKE (NEW)	35	PROVIDENCE	37-22-30	87-47-49	KY5140205-007L01	WEBSTER	TRADEWATER	OWENS CREEK
REFORMATORY LAKE	54	LAGRANGE	38-23-52	85-26-16	KY5140101-004L01	OLDHAM	OHIO	CEDAR CREEK
ROUGH RIVER LAKE	5100	MCDANIELS	37-36-40	86-29-00	KY5110004-013L01	GRAYSON\BRCKINRDGE	GREEN	ROUGH RIVER
SALEM LAKE	99	HODGENVILLE	37-35-29	85-42-41	KY5110001-016L01	LARUE	GREEN	SALEM CREEK
SANDLICK CREEK LAKE	74	BURTONVILLE	38-23-23	83-36-41	KY5100101-021L01	FLEMING	LICKING	SAND LICK CREEK
SCENIC LAKE	18	EVANSVILLE S,ILL-KY	37-52-42	87-33-37	KY5140202-006L01	HENDERSON	OHIO	UT TO OHIO RIVER

LAKE NAME	TOTAL ACRES	USGS QUADRANGLE	LATI-TUDE	LONGI-TUDE	WATERBODY SYSTEM NUMBER	COUNTY NAME	RIVER BASIN	SUBBASIN
SHANTY HOLLOW LAKE	135	REEDYVILLE	37-09-02	86-23-13	KY5110001-005L01	WARREN	GREEN	CLAY LICK CREEK
SHELBY LAKE (SHELBY CO)	17	SHELBYVILLE	38-13-59	85-13-02	KY5140102-022L01	SHELBY	SALT RIVER	CLEAR CREEK
SHELBY LAKE (BALLARD CO)	24	OLMSTEAD ILL-KY	37-11-01	89-01-52	KY8010100-001L08	BALLARD	OHIO	GAR CREEK
SMOKEY VALLEY LAKE	36	GRAHN	38-21-59	83-07-41	KY5090103-007L01	CARTER	TYGARTS CREEK	SMOKEY CREEK
SPA LAKE (MUD RIVER MPS 6A)	240	SHARON GROVE	36-56-04	87-01-25	KY5110003-007L01	LOGAN	GREEN	WOLF LICK CREEK
SPURLINGTON LAKE	36	SPURLINGTON	37-23-18	83-15-12	KY5110001-034L01	TAYLOR	GREEN	BRUSHY FK, ROBINSON CK
STANFORD CITY RESERVOIR	43	HALLS GAP	37-29-12	84-40-48	KY5100205-044L01	LINCOLN	KENTUCKY	NEALS CREEK
SYMPSON LAKE	184	CRAVENS	37-48-27	85-30-17	KY5140103-011L01	NELSON	SALT	BUFFALO CREEK
SWAN POND	193	BARLOW,KY-ILL	37-15-50	89-07-05	KY8010100-001L04	BALLARD	MISSISSIPPI	MINOR SLOUGH
TAYLORSVILLE LAKE	3050	TAYLORSVILLE	38-00-05	85-13-12	KY5140102-025L01	SPENCER	SALT	N\A
TURNER LAKE	61	OLMSTEAD,ILL-KY	37-10-22	89-02-30	KY5140206-001L01	BALLARD	OHIO	HUMPHREY CREEK
TYNER LAKE	87	MCKEE	37-22-09	83-54-47	KY5130102-010L01	JACKSON	UPPER CUMBERLAND	FLAT LICK CREEK
WILGREEN LAKE	169	RICHMOND SOUTH	37-42-44	84-20-43	KY5100205-052L01	MADISON	KENTUCKY	TRACE FORK,SILVER CK
WILLIAMSTOWN LAKE	300	WILLIAMSTOWN	38-40-38	84-31-15	KY5100101-007L01	GRANT	LICKING	SF GRASSY CREEK
WILLISBURG LAKE	126	BRUSH GROVE	37-49-32	85-09-24	KY5140103-017L01	WASHINGTON	SALT	LICK CREEK
WOOD CREEK LAKE	672	BERNSTADT	37-11-24	84-10-48	KY5130102-005L01	LAUREL	UPPER CUMBERLAND	WOOD CREEK
YATESVILLE LAKE	2242	FALLSBURG, KY-WV	38-07-27	82-42-58	KY5070204-005L01	LAWRENCE	BIG SANDY	BLAINE CREEK

COLUMN HEADER	DEFINITION
ASSESSMENT:	
DATE	year of the most recent assessment
CAT	CATEGORY = the type of assessment made in determining the water quality condition of the waterbody M (monitored) assessments were based on current (<10 yrs. old) site-specific data E (evaluated) assessments were based on information other than site specific criteria
TYPE	one digit code representing the type of water quality assessment made on the waterbody: 1 = assessment based on growing season sampling regime (three times per year) 2 = assessment based on data collected over time at fixed monitoring stations 3 = assessment based on Division of Water collections 4 = assessment based on U.S.Corps of Engineers collections 5 = assessment based on Tennessee Valley Authority collections
TROPHIC STATUS	the trophic state of the waterbody at the most recent assessment
TOX MON?	Toxics Monitoring? an indication of the existence of information (Y=yes;N=no) indicating the presence or absence of toxics in the waterbody
TOXIC CODES	the type of toxics monitoring information gathered at the waterbody 1 = Organics in the water column 2 = Organics in fish tissue 3 = Pesticides in water column 4 = Pesticides in fish tissue 5 = Metals in the water column 6 = Metals in the sediment 7 = Metals in fish tissue 8 = Toxics testing of discharge
FISH CONSUMPTION:	
SUPP	no fish/shellfish advisories or bans in effect
PART	a fish/shellfish advisory or ban in effect for "restricted consumption" which limits the number of meals or amount consumed per unit time
NOT	a fish/shellfish advisory or ban with a commercial fishing/shellfishing ban in effect for "no consumption" for one or more fish species

COLUMN HEADER	DEFINITION	
SWIMMABLE:		
SUPP	the number of acres which support water-based recreational activities	
PART	the number of acres which partially support water-based recreational activities	
NOT	the number of acres which do not support water-based recreational activities	
USE SUPPORT:	Use Support Status	
FULL	all uses are supported(based on data)	
PART	one or more uses are partially supported and the remaining uses are fully supported	
NOT	one or more uses are not being supported	
	1) WAH = warmwater aquatic habitat	
	2) CAH = coldwater aquatic habitat	
	3) PCR = primary contact recreation	
	4) SCR = secondary contact recreation	
	5) DWS = domestic water supply	
CAUSE\SOURCE:	a code which refers to the cause and source of the impact that caused the waterbody to either not or partially support the use	
	1 = metals	A = natural
	2 = nutrients	B = lake fertilization
	3 = suspended solids	C = municipal (package treatment plants)
	4 = shallow lake basin	D = septic tanks
	5 = pH	E = unspecified nonpoint source
	6 = other inorganics	F = surface mining/deep mining/abandoned lands
	7 = priority organics	G = agricultural nonpoint source
	8 = low dissolved oxygen/organic enrichment	H = animal holding and management areas
		I = in-place contaminants (sediments)
		J = industrial
		K = unknown

LAKE NAME	ASSESSMENT:			TROPHIC STATUS	TOX MON?	TOXIC CODES	FISH CONSUMPTION:			SWIMMABLE:			USE FULLY SUPPORTED	USE PART SUPPORTED	USE NOT SUPPORTED	CAUSE/ SOURCE
	DATE	CAT	TYPE				S	PS	NS	S	PS	NS				
A.J.JOLLY LAKE	1989	M	1,3	EUTROPHIC	N		204			204			WAH,PCR,SCR,DWS			
ARROWHEAD LAKE	1989	M	1,3	EUTROPHIC	N		37			37			WAH,PCR,SCR			
BARREN RIVER LAKE	1987	M	2,4	MESOTROPHIC	N		10000			10000			WAH,PCR,SCR,DWS			
BEAVER CREEK ARM	1987	M	2,4	EUTROPHIC	N								WAH,PCR,SCR			
SKAGGS CREEK ARM	1987	M	2,4	MESOTROPHIC	N								WAH,PCR,SCR			
BEAVER LAKE	1989	M	1,3	EUTROPHIC	N		158			158			WAH,PCR,SCR			
BEAVER DAM LAKE	1991	M	1,3	HYPER-EUTROPHIC	N		50			50			WAH,PCR,SCR			
BERT COMBS LAKE	1990	M	1,3	EUTROPHIC	N		36			36			WAH,PCR,SCR,DWS			
BOLTZ LAKE	1989	M	1,3	EUTROPHIC	N		92			92			WAH,PCR,SCR			
BRIGGS LAKE	1990	M	1,3	EUTROPHIC	N		18			18			PCR,SCR		WAH	2,B
BUCK LAKE	1989	M	1,3	EUTROPHIC	N		19			19			WAH,PCR,SCR			
BUCKHORN LAKE	1989	M	2,4	OLIGOTROPHIC	Y	1,3,5,6	1230			1230			WAH,PCR,DWS	SCR		3,F
BULLOCK PEN LAKE	1989	M	1,3	EUTROPHIC	N		134			134			WAH,PCR,SCR,DWS			
BURNT POND	1989	M	1,3	EUTROPHIC	N		10			10			WAH,PCR,SCR			
CAMPBELLSVILLE CITY RES.	1989	M	1,3	EUTROPHIC	N		63			63			PCR,DWS	WAH,SCR		2,G/4,A
CAMPTON LAKE	1990	M	1,3	MESOTROPHIC	N		26			26			WAH,PCR,SCR,DWS			
CANEYVILLE CITY RESERVOIR	1990	M	1,3	EUTROPHIC	N		75			75			WAH,PCR	DWS,SCR		2,4,A
CANNON CREEK LAKE	1990	M	1,3	OLIGOTROPHIC	N		243			243			WAH,PCR,SCR,DWS			
CARPENTER LAKE	1990	M	1,3	EUTROPHIC	N		64			64			WAH,PCR,SCR			
CARR FORK LAKE	1989	M	2,4	EUTROPHIC	Y	1,3,5,6	710			710			WAH,PCR	SCR		3,F
CAVE RUN LAKE	1989	M	2,4	MESOTROPHIC	Y	1,3,5,6	8270			8270			WAH,PCR SCR			
CHENOA LAKE	1990	M	1,3	MESOTROPHIC	N		37			37			WAH,PCR,SCR			
CORBIN CITY RESERVOIR	1990	M	1,3	MESOTROPHIC	N		139			139			WAH,PCR,SCR		DWS	2,C,G
CORINTH LAKE	1989	M	1,3	EUTROPHIC	N		96			96			WAH,PCR,SCR			
CRANKS CREEK LAKE	1993	M	1,3	MESOTROPHIC	N		219				219			WAH,PCR,SCR		5,F
DALE HOLLOW LAKE	1979	M	2,4	OLIGOTROPHIC	N		4300			4300			WAH,PCR,SCR			
DEWEY LAKE	1991	M	2,4	MESOTROPHIC	Y	1,3,5,6	1100			1100			WAH,PCR	SCR		3,F
DOE RUN LAKE	1989	M	1,3	EUTROPHIC	N		51			51			WAH,PCR,SCR			
ELMER DAVIS LAKE	1989	M	1,3	EUTROPHIC	N		149			149			WAH,PCR,SCR			

LAKE NAME	ASSESSMENT:			TROPHIC STATUS	TOX MON?	TOXIC CODES	FISH CONSUMPTION:			SWIMMABLE:			USE FULLY SUPPORTED	USE PART SUPPORTED	USE NOT SUPPORTED	CAUSE/ SOURCE
	DATE	CAT	TYPE				S	PS	NS	S	PS	NS				
ENERGY LAKE	1989	M	1,3	EUTROPHIC	N		370			370			WAH,PCR,SCR			
FISH LAKE	1989	M	1,3	EUTROPHIC	N		27			227			WAH,PCR,SCR			
FISHPOND LAKE	1990	M	1,3	EUTROPHIC	N		32			32			WAH,PCR,SCR			
FISHTRAP LAKE	1992	M	2,4	MESOTROPHIC	Y	1,3,5,6	1143			1143			WAH,PCR,SCR			
FLAT LAKE	1989	M	1,3	EUTROPHIC	N		38			38			WAH,PCR,SCR			
FREEMAN LAKE	1990	M	1,3	EUTROPHIC	N		160			160			WAH,PCR,SCR			
GENERAL BUTLER ST.PK. LAKE	1989	M	1,3	EUTROPHIC	N		29			29			WAH,PCR,SCR			
GRAPEVINE LAKE	1990	M	1,3	MESOTROPHIC	N		50			50			WAH,PCR,SCR	DWS		2,K
GRAYSON LAKE	1989	M	2,4	OLIGOTROPHIC	Y	1,3,5,6	1512			1512			WAH,PCR,SCR			
GREENBRIAR LAKE	1990	M	1,3	EUTROPHIC	N		66			66			WAH,PCR,SCR,DWS			
GREENBO LAKE	1989	M	1,3	MESOTROPHIC	N		181			181			WAH,PCR,SCR			
GREEN RIVER LAKE	1990	M	2,4	MESOTROPHIC	Y	1,2,3,5,6		8210		8210			WAH,PCR,SCR,DWS			7,J
GUIST CREEK LAKE	1989	M	1,3	EUTROPHIC	N		317			317			PCR,SCR	WAH,DWS		2,G/1,A
HAPPY HOLLOW LAKE	1991	M	1,3	HYPER-EUTROPHIC	N		20			20			WAH,PCR,SCR			
HEMATITE LAKE	1989	M	1,3	MESOTROPHIC	N		90			90			WAH,PCR,SCR			
HERRINGTON LAKE	1989	M	1,3	EUTROPHIC	N		2940			2940			PCR,SCR,DWS		WAH	2,C,D,G
HONKER LAKE	1989	M	1,3	MESOTROPHIC	N		190			190			PCR,SCR	WAH		2,A
KENTUCKY LAKE	1993	M	2,4	EUTROPHIC	Y	1,2,3,4,5, 6,7	49100			49100			WAH,PCR,SCR,DWS			
KINCAID LAKE	1990	M	1,3	EUTROPHIC	N		183			183			PCR,SCR	WAH		2,E
KINGFISHER LAKE	1990	M	1,3	EUTROPHIC	N		30			30			WAH,PCR,SCR			
LAKE BARKLEY	1984	M	5	EUTROPHIC	N		45600			45600			WAH,PCR,SCR,DWS			
LAKE BESHEAR	1990	M	1,3	MESOTROPHIC	N		760			760			PCR,SCR,DWS	WAH		2,A
LAKE BLYTHE	1990	M	1,3	MESOTROPHIC	N		89			89			WAH,PCR,SCR			
LAKE CARNICO	1990	M	1,3	EUTROPHIC	N		114			114			WAH,PCR,SCR			
LAKE CUMBERLAND	1982	M	2,4	OLIGOTROPHIC	N		49108			49108			WAH,PCR,SCR,DWS			
LILY CREEK ARM	1991	M	1,3	EUTROPHIC	N		144			144			WAH,PCR,SCR			
BEAVER CREEK ARM	1990	M	1,3	EUTROPHIC	N		742			742			WAH,PCR,SCR			
PITMAN CREEK ARM	1993	M	1,3	EUTROPHIC	N		256			256			WAH,PCR,SCR			

LAKE NAME	ASSESSMENT:			TROPHIC STATUS	TOX MON?	TOXIC CODES	FISH CONSUMPTION:			SWIMMABLE:			USE FULLY SUPPORTED	USE PART SUPPORTED	USE NOT SUPPORTED	CAUSE/ SOURCE
	DATE	CAT	TYPE				S	PS	NS	S	PS	NS				
LAKE GEORGE	1990	M	1,3	EUTROPHIC	N		58			53			PCR,SCR,DWS	WAH		2,G
LAKE JERICHO	1992	M	1,3	EUTROPHIC	N		137			137			PCR,SCR	WAH		2,G
LAKE LINVILLE	1990	M	1,3	MESOTROPHIC	N		273			273			WAH,PCR,SCR,DWS			
LAKE MALONE	1990	M	1,3	EUTROPHIC	N		826			826			WAH,PCR,SCR			
LAKE MORRIS	1990	M	1,3	MESOTROPHIC	N		170			170			WAH,PCR,SCR,DWS			
LAKE PEWEE	1990	M	1,3	MESOTROPHIC	N		360			360			WAH,PCR,SCR	DWS		2,G
LAKE WASHBURN	1990	M	1,3	EUTROPHIC	N		26			26			PCR,SCR	WAH		2,K
LAUREL CREEK LAKE	1990	M	1,3	MESOTROPHIC	N		88			88			WAH,PCR,SCR,DWS			
LAUREL RIVER LAKE	1993	M	2,4	OLIGOTROPHIC	N		4990			4990			WAH,PCR SCR,DWS			
MIDLAKE-LAUREL R. ARM	1993	M	2,4	MESOTROPHIC	N		754			754			WAH,PCR,SCR,DWS			
HEADWTRS-LAUREL R. ARM	1993	M	2,4	EUTROPHIC	N		316			316			WAH,PCR,SCR			
LIBERTY LAKE	1989	M	1,3	MESOTROPHIC	N		79			79			WAH,PCR,SCR,DWS			
LOCH MARY	1990	M	1,3	OLIGOTROPHIC	N		135			135			WAH,PCR,SCR		DWS	1,6,F
LONG POND	1989	M	1,3	EUTROPHIC	N		56			56			WAH,PCR,SCR			
LONG RUN PARK LAKE	1989	M	1,3	MESOTROPHIC	N		27			27			WAH,PCR,SCR			
LUZERNE LAKE	1990	M	1,3	MESOTROPHIC	N		55			55			WAH,PCR,SCR	DWS		2,E
MARION COUNTY LAKE	1989	M	1,3	EUTROPHIC	N		21			21			WAH,PCR	SCR		2,B
MARTIN'S FORK LAKE	1993	M	2,4	MESOTROPHIC	N		334			334			WAH,PCR,SCR			
MAUZY LAKE	1990	M	1,3	EUTROPHIC	N		84			84			PCR,SCR		WAH	2,B
MCNEELY LAKE	1993	M	1,3	EUTROPHIC	N		51			51			PCR,SCR	WAH		2,I
METCALFE COUNTY LAKE	1990	M	1,3	EUTROPHIC	N		22			22			PCR	WAH,SCR		2,4,A,G
METROPOLIS LAKE	1989	M	1,3	EUTROPHIC	N		36			36			WAH,PCR,SCR			
MILL CREEK L. (MONROE CO.)	1990	M	1,3	MESOTROPHIC	N		109			109			WAH,PCR,SCR,DWS			
MILL CREEK L. (POWELL CO.)	1990	M	1,3	MESOTROPHIC	N		41			41			WAH,PCR,SCR,DWS			
MITCHELL LAKE	1991	M	1,3	HYPER-EUTROPHIC	N		58			58			WAH,PCR,SCR			
MOFFIT LAKE	1990	M	1,3	EUTROPHIC	N		49			49			WAH,PCR,SCR			
NOLIN RIVER LAKE	1989	M	2,4	MESOTROPHIC	Y	1,3,5,6	5790			5790			WAH,PCR,SCR			
PAINTSVILLE LAKE	1989	M	2,4	MESOTROPHIC	Y	1,3,5,6	1139			1139			WAH,PCR,SCR			
PANBOWL LAKE	1990	M	1,3	MESOTROPHIC	N		98			98			WAH,PCR,SCR			

LAKE NAME	ASSESSMENT:			TROPHIC STATUS	TOX MON?	TOXIC CODES	FISH CONSUMPTION:			SWIMMABLE:			USE FULLY SUPPORTED	USE PART SUPPORTED	USE NOT SUPPORTED	CAUSE/ SOURCE
	DATE	CAT	TYPE				S	PS	NS	S	PS	NS				
PENNYRILE LAKE	1991	M	1,3	EUTROPHIC	N		47			47			WAH,PCR,SCR			
PROVIDENCE CITY LAKE (NEW)	1990	M	1,3	MESOTROPHIC	N		35			35			WAH,PCR,SCR,DWS			
REFORMATORY LAKE	1993	M	1,3	EUTROPHIC	N		54			54			PCR,SCR	WAH		2,I
ROUGH RIVER LAKE	1989	M	2,4	MESOTROPHIC	Y	1,3,5,6	5100			5100			WAH,PCR,SCR,DWS			
SALEM LAKE	1990	M	1,3	EUTROPHIC	N		99			99			WAH,PCR,DWS	SCR		4,A
SANDLICK CREEK LAKE	1989	M	1,3	EUTROPHIC	N		74			74			PCR	WAH,SCR		2,G/4,A
SCENIC LAKE	1990	M	1,3	EUTROPHIC	N		18			18			PCR,SCR	WAH		2,I
SHANTY HOLLOW LAKE	1991	M	1,3	EUTROPHIC	N		135			135			WAH,PCR,SCR			
SHELBY LAKE (SHELBY CO.)	1990	M	1,3	EUTROPHIC	N		17			17			PCR,SCR	WAH		2,G,I
SHELBY LAKE (BALLARD CO.)	1991	M	1,3	EUTROPHIC	N		24			24			WAH,PCR,SCR			
SMOKEY VALLEY LAKE	1989	M	1,3	MESOTROPHIC	N		36			36			WAH,PCR,SCR			
SPA LAKE (MUD RIV. MPS 6A)	1990	M	1,3	EUTROPHIC	N		240			240			PCR,DWS	WAH,SCR		2,G/4,A
SPURLINGTON LAKE	1989	M	1,3	EUTROPHIC	N		36			36			WAH,PCR,SCR			
STANFORD CITY RESERVOIR	1989	M	1,3	OLIGOTROPHIC	N		43			43			WAH,PCR,SCR	DWS		2,A
SYMPSON LAKE	1990	M	1,3	EUTROPHIC	N		184			184			WAH,PCR,SCR,DWS			
SWAN POND	1989	M	1,3	EUTROPHIC	N		193			193			WAH,PCR,SCR			
TAYLORSVILLE LAKE	1993	M	2,4	EUTROPHIC	Y	1,3,5,6	3050			3050			PCR,SCR	WAH		2,G
TURNER LAKE	1989	M	1,3	EUTROPHIC	N		61			61			WAH,PCR,SCR			
TYNER LAKE	1990	M	1,3	MESOTROPHIC	N		87			87			WAH,PCR,SCR,DWS			
WILGREEN LAKE	1990	M	1,3	EUTROPHIC	N		169			169			PCR	WAH,SCR		2,D
WILLIAMSTOWN LAKE	1990	M	1,3	EUTROPHIC	N		300			300			WAH,PCR,SCR,DWS			
WILLISBURG LAKE	1989	M	1,3	EUTROPHIC	N		126			126			WAH,PCR,SCR,DWS			
WOOD CREEK LAKE	1989	M	1,3	MESOTROPHIC	N		672			672			WAH,PCR,SCR	DWS		2,D
YATESVILLE LAKE	1993	M	2,4	MESOTROPHIC	Y	1,3,5,6	2,242			2,242			PCR,SCR	WAH		8,A

APPENDIX E

NONPOINT SOURCE IMPACTED WATERBODIES

Nonpoint Source Impacted Streams and Lakes

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES 1 2 3 4 5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED*
BIG SANDY RIVER, LITTLE SANDY RIVER, AND TYGARTS CREEK BASINS						
BIG SANDY RIVER BASIN						
KY05070201-001	TUG FORK	65 51 52 21	SED,BACT,TSS,DO,SO_4	KNPS,1987; KDOW-BIO, 1987, 1992-93; KDOW-AMB,1990-93	MONITORED	WAH, PCR
KY05070201-002	COLDWATER FORK	50 55	pH, SED, MET, TSS, CL	KDFWR, 1993	EVALUATED	PCR, WAH
KY05070201-003	WOLF CREEK	50 51 52 32 65	pH, SED, SO_4, MET, BACT	KNPS SURVEY, 1987; KDFWR, 1993	EVALUATED	WAH, PCR
KY05070201-003	MEATHOUSE CREEK	50	pH	KDFWR, 1993	EVALUATED	WAH, PCR
KY05070201-003	PIGEONROOST CREEK	50	pH	KDFWR, 1993	EVALUATED	WAH, PCR
KY05070201-003	WHITEOAK CREEK	50	pH	KDFWR, 1993	EVALUATED	WAH, PCR
KY05070201-003	PETER CAVE CREEK	50	pH	KDFWR, 1993	EVALUATED	WAH, PCR
KY05070201-003	EMILY CREEK	50	pH	KDFWR, 1993	EVALUATED	WAH, PCR
KY05070201-004	TUG FORK	65 51 52 21	BACT, SED, SO_4	KNPS, 1987; KDOW-BACT, 1988	EVALUATED	PCR
KY05070201-005	BIG CREEK	50 10 51 52 65	SED, BACT, SO_4	KNPS,1987; KDOW,1988b; KDFWR,1988	EVALUATED	WAH
KY05070201-010	KNOX CREEK	65 10 51 52 80	BACT, SED, SO_4	KNPS, 1987; KDOW-BACT, 1988	EVALUATED	PCR
KY05070202-001	LEVISA FORK	65 51 52 40 80	BACT, SED, SO_4, MET	KNPS,1987; KDOW-BACT,1988; KDOW-BIO, 1990-93; KDOW-AMB, 1986-93	MONITORED	PCR, WAH-P
KY05070202-003	GREASY CREEK	50	SED	KDFWR, 1993	EVALUATED	WAH
KY05070202-004	RUSSELL FORK	65 10	BACT	KDOW-BACT, 1988	EVALUATED	PCR
KY05070203-001	LEVISA FORK	50 40 65 10 83	SED,BACT,TSS,MET,NUT,SO_4	KNPS, 1987; KDFWR, 1993; KDOW-BIO, 1992-93	EVALUATED	WAH, PCR
KY05070203-005	PAINT CREEK	40	BACT	KDOW-BACT, 1988	EVALUATED	PCR
KY05070203-006	JENNYS CREEK	31 51 55 80 32	SED, Cl, SO_4, MET	KNPS SURVEY, 1987; KDFWR, 1993	EVALUATED	WAH
KY05070203-007	MUDLICK CREEK	51 52 83 80 31	SED, Cl, BACT, SO_4, MET	KNPS SURVEY, 1987; KDFWR, 1993	EVALUATED	WAH
KY05070203-010	LEVISA FORK	50 10	SED	KDOW-AMB, 1990-91; KDFWR, 1993	MONITORED	WAH-P, PCR
KY05070203-013	BRUSHY CREEK	51 52 65 80 32	SED, BACT, SO_4, MET	KNPS SURVEY, 1987; KDFWR, 1993	EVALUATED	WAH
KY05070203-013	BUFFALO CREEK	51 80 65 32 83	SED, BACT, SO_4, MET	KNPS SURVEY, 1987; KDFWR, 1993	EVALUATED	WAH
KY05070203-013	RACCOON CREEK	51 52 65 80 61	SED, BACT, SO_4, MET	KNPS SURVEY, 1987, KDFWR, 1993	EVALUATED	WAH
KY05070203-013	LF. FORK BRUSHY CREEK	51 52 65 80 32	SED, BACT, SO_4, MET	KDFWR, 1993	EVALUATED	WAH
KY05070203-014	MIDDLE CREEK, LF. FORK	50 51 65 80 32	pH, SED, SO_4, BACT, MET	KNPS,1987; KDFWR,1987; KDOW,1988b; KDFWR, 1993	EVALUATED	WAH, PCR

Nonpoint Source Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES 1 2 3 4 5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED*
KY05070203-017	BULL CREEK	51 57 77 65 32	SED, BACT, SO_4, MET	KNPS SURVEY, 1987; KDFWR, 1993	EVALUATED	WAH
KY05070203-018	BEAVER CREEK	51 65 40 80 32	pH, Fe, SO_4, COND	KNPS, 1987; USGS, 1980; KDFWR, 1993	EVALUATED	PCR, WAH
KY05070203-020	BEAVER CREEK, LF. FORK	50 40 65 80 32	SED, pH, NUTR, BACT	KNPS SURVEY, 1987; KDFWR, 1993	EVALUATED	WAH
KY05070203-021	LEVISA FORK	65 51 52 40 70	BACT, SED, TSS, DO	KDOW-BIO,1988-93;KDOW-AMB,1990-91	MONITORED	PCR, WAH-P
KY05070204-001	BIG SANDY RIVER	10 65 50 90	BACT, MET	ORSANCO, 1988-93; USGS, 1992-93	MONITORED	WAH, PCR
KY05070204-006	BLAINE CREEK, LEFT FK	55	Cl, TDS	KDOW-IS, 1990	MONITORED	WAH-P
KY05070204-006	BLAINE CREEK, RIGHT FK	55	Cl, TDS	KDOW-IS, 1990	MONITORED	WAH-P
LITTLE SANDY RIVER BASIN						
KY05090104-001	LITTLE SANDY RIVER	65 10	BACT	KDOW-AMB/BIO, 1988-89	MONITORED	PCR
KY05090104-003	BIG RUN	51	INORGANICS	KDOW-IS, 1991	EVALUATED	WAH-P
KY05090104-003	E. FORK LITTLE SANDY RIVER	51 10 80 65	SED, SO_4, MET, NUT	KNPS, 1987; KDOW-IS, 1991	MONITORED	WAH-P
KY05090104-004	LITTLE SANDY RIVER	65 10 60 11 18	BACT, SED, NUTR	KNPS,1987;KDOW-BIO,1988-93;DOW-AMB,1990-93	MONITORED	PCR-P
KY05090104-009	NEWCOMBE CREEK	55 51 80 65 50	Cl,TDS,SED,BACT,SO_4,MET	KNPS, 1987; KDOW-IS, 1990-91	MONITORED	WAH
LAKE						
KY05070203-012L01	DEWEY LAKE	51 31 32 65	SED, TSS, BACT	KDOW, 1988B; KDOW-LAKE, 1991	MONITORED	SCR-P

LICKING RIVER BASIN

KY05100101-001	LICKING RIVER	40 90	BACT, MET	ORSANCO, 1990-91;KDOW-BACT, 1987, 1992-93	MONITORED	PCR,WAH
KY05100101-002	BANKLICK CREEK	40 30 10 60	BACT, NUTR, MET, SED	KNPS SURVEY, 1987; KDOW-BACT, 1987	EVALUATED	PCR
KY05100101-003	THREE-MILE CREEK	40	BACTERIA	KDOW-BACT, 1990-91	MONITORED	PCR
KY05100101-004	LICKING RIVER	10 11 80 14 20	BACT, SED, NUTR	KNPS, 1987; USGS, 1990-93	MONITORED	PCR
KY05100101-012	NORTH FORK LICKING RIVER	10	BACTERIA	KDOW-BIO, 1986, 1992-93; KDOW-AMB, 1990-93	MONITORED	PCR
KY05100101-015	LICKING RIVER	10 80 21 11 65	BACT, SED, NUTR	KNPS,1987; KDOW-AMB,1990-93; KDOW-BIO,1992-93	MONITORED	PCR
KY05100101-018	FLEMING CREEK	14 10 16 80	BACT, NUTR, SED, MET	KNPS SURVEY, 1987; KDOW-NPS, 1992	MONITORED	PCR
KY05100101-018	ALLISON CREEK	16 14	BACT, NUTR, ORG	KDOW-NPS, 1992-93	MONITORED	PCR, WAH
KY05100101-018	CRAINTOWN BRANCH	16 14	BACT, NUTR	KDOW-NPS, 1992-93	MONITORED	PCR, WAH-P
KY05100101-018	POPLAR CREEK	16 14	BACT, NUTR	KDOW-NPS, 1992-93	MONITORED	PCR-P
KY05100101-018	FLAT RUN	16 14	BACT, NUTR	KDOW-NPS, 1992-93	MONITORED	PCR-P
KY05100101-018	CASSIDY CREEK	16 14	BACT, NUTR	KDOW-NPS, 1992-93	MONITORED	PCR-P
KY05100101-018	LOGAN RUN	16 14	BACT, NUTR	KDOW-NPS, 1992-93	MONITORED	PCR-P

Nonpoint Source Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES 1 2 3 4 5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED*
KY05100101-018	SLEEPY RUN	16 14	BACT, NUTR	KDOW-NPS, 1992-93	MONITORED	PCR
KY05100101-018	WILSON RUN	16 14	BACT, NUTR	KDOW-NPS, 1992-93	MONITORED	PCR
KY05100101-034	LICKING RIVER	65 10 55 51 80	BACT,Cl,TDS,MET,COND,SED, O/G	KNPS, 1987; KDOW, 1988b; KDOW-AMB, 1990-93; KDOW-BIO, 1992-93; KDFWR, 1993	MONITORED	WAH, PCR
KY05100101-037	LICK CREEK	55 80 32 11	Cl, TDS, SED	KNPS, 1987; KDOW-IS, 1986	EVALUATED	WAH
KY05100101-037	RACCOON CREEK	55	Cl, TDS	KDOW-IS, 1986	EVALUATED	WAH
KY05100101-038	BURNING FORK	55	Cl, TDS	KDOW-IS, 1986	EVALUATED	WAH
KY05100101-038	STATE ROAD FORK	55	Cl, TDS	KDOW-IS, 1986	EVALUATED	WAH
KY05100101-039	LICKING RIVER	50 51 55 80 11	SED, Cl, TDS, COND, DO	KNPS SURVEY, 1987; KDFWR, 1993	EVALUATED	WAH
KY05100102-001	SOUTH FORK LICKING RIVER	10 11 12 14 18	BACT,NUTR,PEST,SED,MET	KNPS SURVEY, 1987; KDOW-BIO/AMP, 1992-93	MONITORED	PCR
KY05100102-010	SOUTH FORK LICKING RIVER	40 10 11 12 14	SED, NUTR,BACT,PEST,MET	KNPS,1987; KDOW-BIO,1986; KDOW-AMB,1990-91	MONITORED	PCR-P,WAH-P
KY05100102-012	STONER CREEK	40 10 11 16 14	BACT, MET, NUTR, SED	KNPS, 1987; KDOW-BACT, 1987	EVALUATED	PCR
KY05100102-013	HOUSTON CREEK	10	BACTERIA	KDOW-BACT,1987	EVALUATED	PCR
KY05100102-017	HANCOCK CREEK	40 10	BACTERIA	KDOW-BACT, 1987	EVALUATED	PCR
KY05100102-017	STRODES CREEK	10 40 11 14 16	BACT, SED, PEST	KNPS, 1987; KDOW-BACT, 1987; KDFWR, 1993	EVALUATED	PCR
KY05100102-020	BIG BRUSHY CREEK	10 11 62 80 32	NUTR, SED, BACT	KNPS, 1987; KDOW-IS, 1986; KDFWR, 1993	EVALUATED	WAH
KY05100102-024	HINKSTON CREEK	10 80 11 12 40	BACT, NUTR, SED, MET	KNPS, 1987; KDOW-BACT, 1987	EVALUATED	PCR
LAKE						
KY05100101-021L01	SAND LICK CREEK LAKE	10	NUTRIENTS	KDOW-LAKE, 1989	MONITORED	WAH-P,SCR-P
KY05100101-008L01	KINCAID LAKE	10	D.O.	KDOW-LAKE, 1990	MONITORED	WAH

KENTUCKY RIVER BASIN

KY05100201-006	CANEY CREEK	65 10 80	BACT, SED	KNPS, 1987; KDOW-IS, 1990	MONITORED	PCR
KY05100201-007	SPRING FORK	50	SED	KDFWR, 1987	EVALUATED	WAH
KY05100201-009	LOST CREEK	50 80	SED, NUTR, BACT	KNPS, 1987; KDFWR, 1987	EVALUATED	WAH
KY05100201-009	TROUBLESOME CREEK	40 65 51 52 55	BACT, SO_4, MET, SED	KNPS, 1987; KDOW-BACT, 1988, 1990	MONITORED	PCR
KY05100201-010	NORTH FORK KENTUCKY RIVER	65 51 52 21	BACT, SED, SO_4, MET	KNPS, 1987; KDOW-BACT, 1991-93; KDFWR, 1993	MONITORED	WAH, PCR-P
KY05100201-011	GRAPEVINE CREEK	51 52 80 32	SED, SO_4, MET	KNPS SURVEY, 1987; KDFWR, 1993	EVALUATED	WAH
KY05100201-012	NORTH FORK KENTUCKY RIVER	65 50 55 32	BACT, MET, AS, Cl, SO_4	KNPS SURVEY, 1987; KDOW-BACT, 1991-93	MONITORED	PCR
KY05100201-017	NORTH FORK KENTUCKY RIVER	65 51 11 52 32	BACT, SED, AS, MET, Cl	KNPS SURVEY, 1987; KDOW, 1991-93	MONITORED	PCR
KY05100201-018	LEATHERWOOD CREEK	50	pH	KDFWR, 1993	EVALUATED	PCR, WAH

Nonpoint Source Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES 1 2 3 4 5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED*
KY05100201-018	LITTLE LEATHERWOOD CREEK	50	pH	KDFWR, 1993	EVALUATED	PCR, WAH
KY05100201-019	TURKEY CREEK	51 80 21 55	SED, SO_4, MET, Cl	KNPS SURVEY, 1987; KDFWR, 1993	EVALUATED	WAH
KY05100201-021	ROCKHOUSE CREEK	50 51 57 80 21	SED, MET, SO_4	KNPS SURVEY, 1987; KDOW, 1988b	EVALUATED	WAH
KY05100201-022	CARR FORK	65	BACT	KDOW-BACT, 1990-93	MONITORED	PCR
KY05100201-022	NORTH FORK KENTUCKY RIVER	50 65	SED, BACT	KDOW-BACT, 1991-93; KDFWR, 1993	MONITORED	WAH, PCR
KY05100202-004	MIDDLE FORK KENTUCKY RIV.	50	SED	KDFWR, 1993	EVALUATED	WAH
KY05100202-005	MIDDLE FORK KENTUCKY RIV.	50	SED	KDFWR, 1993	EVALUATED	WAH
KY05100202-006	CUTSHIN CREEK	55 50 51 80 52	OIL-GREASE, SED, MET,SO_4,Cl	KNPS, 1987; KDFWR, 1987	EVALUATED	WAH
KY05100202-006	RACCOON CREEK	55 50	OIL-GREASE, SED	KDFWR, 1987	EVALUATED	WAH
KY05100202-007	MIDDLE FORK KENTUCKY RIV.	51 57 52 21 80	SED, MET, SO_4, Cl	KNPS SURVEY, 1987; KDFWR, 1993	EVALUATED	WAH
KY05100204-009	BIG SINKING CREEK	55	Cl, TDS	KDOW-IS, 1989; USFS , 1987-88	MONITORED	WAH
KY05100204-009	BILLEY FORK	55	Cl, TDS	KDOW-IS, 1989	MONITORED	WAH
KY05100204-009	MILLERS CREEK	55 22 11 80	Cl, TDS, SED, MET, NUTR, SO_4	KNPS, 1987; KDOW, 1988b; KDOW-IS, 1989; KDOW-AMB, 1990-91	MONITORED	WAH
KY05100204-010	KENTUCKY RIVER	10	BACT, SED	KDOW-AMB, 1992-93	MONITORED	PCR
KY05100204-013	RED RIVER	40 65 10 55 22	MET, Cl, NUTR, SO_4, BACT	KNPS, 1987; KDOW-AMB, 1990-93	MONITORED	WAH-PCR
KY05100204-017	CAT CREEK	90	DO, MET	USGS, 1990-91	MONITORED	WAH
KY05100204-018	SAND LICK FORK	55	Cl, TDS	KDOW-IS, 1985	EVALUATED	WAH
KY05100204-018	SOUTH FORK RED RIVER	55	Cl, TDS	KDOW-IS, 1985	EVALUATED	WAH
KY05100204-019	RED RIVER	76 77 90 50 21	SED, BACT, MET	KNPS,1987;KDOW-BIO,1987; KDOW-AMB,1990-91	MONITORED	WAH-P,PCR-P
KY05100204-025	RED RIVER	90 76 77 50 10	BACT, SED, MET, Fe, Mn	KNPS,1987;KDOW-BIO,1987; KDOW-AMB,1990-91	MONITORED	WAH-P,PCR-P
KY05100205-003	EAGLE CREEK	10 90 80 65 11	BACT, SED, NUTR, MET	KNPS, 1987; KDOW-AMB, 1990-93	MONITORED	PCR
KY05100205-005	EAGLE CREEK	10 90 80 65	BACT, SED, NUTR, MET	KNPS, 1987; KDOW-AMB, 1990-93	MONITORED	PCR
KY05100205-011	KENTUCKY RIVER	90	BACT	KNPS,1987; USGS,1990-93; USGS-NAQWA,1992-93	MONITORED	PCR-P
KY05100205-018	ELKHORN CREEK	90 46	BACT, MET, SED, NUTR	KNPS, 1987; USGS, 1990-91	MONITORED	PCR
KY05100205-019	NORTH ELKHORN CREEK	10 11 12 13 14	NUTR, MET, SED, BACT	KNPS, 1987; KDOW-IS, 1986-88	EVALUATED	WAH
KY05100205-021	CANE RUN CREEK	90 11 12 14 32	SED, MET, NUTR, BACT	KNPS, 1987; KDOW-IS, 1990	MONITORED	WAH-P
KY05100205-022	NORTH ELKHORN CREEK	10 11 12 13 14	NUTR, SED, BACT	KNPS, 1987; KDOW-IS, 1986-88	EVALUATED	WAH-P
KY05100205-023	DRY RUN	40 10	BACT, NUTR	KDOW-IS, 1986-87	EVALUATED	PCR, WAH-P
KY05100205-023	LANES RUN	10	NUTR	KDOW-IS, 1986-87	EVALUATED	WAH-P
KY05100205-024	NORTH ELKHORN CREEK	10 40	NUTR	KDOW-IS, 1986-88	EVALUATED	WAH-P
KY05100205-025	UNNAMED TRIB/N ELKHORN CK	10	BACT	KDOW-IS, 1986	EVALUATED	PCR

Nonpoint Source Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES 1 2 3 4 5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED*
KY05100205-026	SOUTH ELKHORN CREEK	40 10 11 80 32	BACT, DO, LINDANE, SED	KNPS,1987; KDOW-IS,1986; KDOW-AMB, 1990-93	MONITORED	WAH-P, PCR
KY05100205-028	TOWN BR OF S. ELKHORN CK	40	ORG, NUT	KDOW-IS, 1990	MONITORED	WAH
KY05100205-039	CLARKS RUN	40	pH, ORG	KDOW, 1984	EVALUATED	WAH, PCR
KY05100205-041	DIX RIVER	16 14 11 65 32	BACT, SED	KNPS SURVEY, 1987; KDOW-AMB, 1992-93	MONITORED	PCR-P
KY05100205-047	KENTUCKY RIVER	14 90 11 40 32	BACT, SED, NUTR	KNPS,1987;KDOW-BIO/AMB,1990-93;USGS,'90-91	MONITORED	PCR-P
KY05100205-054	BOONE CREEK	80 14 11 32	SED	KNPS SURVEY, 1987; KDOW-IS, 1993	MONITORED	WAH
LAKES						
KY05100201-015L01	CARR FORK LAKE	51 52 65 32	SED, TSS, BACT	KNPS, 1987; KDOW, 1988b; USACOE, 1990	MONITORED	SCR-P
KY05100202-003L01	BUCKHORN LAKE	51	TSS	KNPS, 1987; KDOW, 1986; USACOE, 1990	MONITORED	SCR-P
KY05100205-038L01	HERRINGTON LAKE	10 65 16 11 32	NUTR, SED, BACT	KNPS, 1987; KDOW-LAKE, 1990-91	MONITORED	WAH
KY05100205-052L01	WILGREEN LAKE	65	NUTR	KDOW, 1988b; KDOW-LAKE, 1990	MONITORED	WAH-P,SCR-P
OHIO RIVER MINOR TRIBS						
KY05090203-004	ELIJAHS CREEK	65	NUTR	KDOW-IS, 1993	MONITORED	WAH
UPPER CUMBERLAND RIVER BASIN						
KY05130101-009	CUMBERLAND RIVER	51	SED, TSS	KDOW-IS, 1993	MONITORED	WAH-T
KY05130101-011	LAUREL CREEK	30 40	SED, MET	KNPS SURVEY, 1987	EVALUATED	CAH-P
KY05130101-016	BUCK CREEK	51 73 77	SED, TSS	CTI, 1987-93	MONITORED	WAH
KY05130101-023	RICHLAND CREEK	90 51 80	BACT, SED, MET, SO_4	KNPS SURVEY, 1987; KDOW-BACT, 1993	MONITORED	PCR-P
KY05130101-028	GREASY CREEK	90 51 21 80	BACT, SED	KNPS SURVEY, 1987; KDOW-IS, 1993	MONITORED	PCR-P
KY05130101-029	LITTLE CLEAR CREEK	51 80 21 73 77	SED, MET, SO_4	MCCOY & MCCOY, 1988-93	MONITORED	WAH-P
KY05130101-030	STRAIGHT CREEK	65 51 73 77 90	BACT, NUTR, SED	KNPS SURVEY, 1987; CTI, 1988-93; MCCOY & MCCOY 1988-93; KDOW-IS 1993	MONITORED	WAH, PCR
KY05130101-031	BENNETTS FORK	50 70	SEDIMENT	KDOW-IS, 1989	MONITORED	WAH-P
KY05130101-031	CLEAR FORK	50 51 80	SEDIMENT	KNPS, 1987; KDOW, 1988b; KDOW-IS, 1989	MONITORED	WAH-P
KY05130101-031	LITTLE YELLOW CREEK	30	SEDIMENT	KDOW-IS, 1989	MONITORED	WAH-P
KY05130101-031	STONY FORK	50 51 21	SED, MET, SO_4	KNPS, 1987; KDOW-IS, 1989, 1993	MONITORED	WAH-P
KY05130101-031	YELLOW CREEK	40 51 23 31	ORG,DO,SED,MET,SO_4,NUT,BACT	KNPS, 1987; KDOW, 1988b; KDOW-IS, 1989, 1993	MONITORED	WAH-P
KY05130101-034	PUCKETT CREEK	90 80 51 52	BACT, SED, MET, SO_4, NUTR,	KNPS SURVEY, 1987; KDOW-IS, 1993	MONITORED	PCR-P
KY05130101-036	POOR FORK	50 52 51 80 21	SED, MET, NUTR, SO_4, BACT, Cl	KNPS,1987; KDFWR, 1987 & 1993; KDOW-IS, 1984	EVALUATED	WAH-P, PCR

Nonpoint Source Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES 1 2 3 4 5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED*
KY05130101-038	CRANKS CREEK	50 51 52 80	pH, MET, SO_4, SED	KNPS,1987; KDFWR, 1987 & 1993; KDOW-IS, 1984; KDFWR, 1993	EVALUATED	WAH, PCR
KY05130101-038	MARTINS FORK	52 51 80	BACT, pH	KNPS, 1987; KDFWR, 1993; KDOW-BACT, 1993	MONITORED	PCR, WAH
KY05130102-001	ROCKCASTLE RIVER	20 50 11 65 80	SED, BACT, MET	KNPS, 1987; KDOW-AMB, 1990-93; KDOW-BIO, 1992-93	MONITORED	WAH-T
KY05130102-007	CROOKED CREEK	50	SEDIMENT	KDFWR, 1981; KDFWR, 1993	EVALUATED	WAH-P
KY05130102-009	HORSE LICK CREEK	20 87 70 57 18	SED, BACT, NUTR, MET, SO_4	KNPS, 1987; KDOW-AMB, 1990-93; KDOW-RR, 1992-93; KDOW-BIO, 1992-93	MONITORED	WAH-T
KY05130103-011	BIG LILY CREEK	40	CL, ORG	KDOW-IS, 1993	MONITORED	WAH
KY05130103-018	BEAVER CREEK	40 65 32	SED, NUTR, MET, BACT	KNPS SURVEY, 1987; USFS, 1987-93	MONITORED	WAH
KY05130104-004	LITTLE SOUTH FORK CUMB. R.	50 11 23 51 55	SED, Cl, TDS, NUTR, BACT	KNPS,1987; KDOW-IS,1988-89; KDOW-RR, 1992-93	MONITORED	WAH-T
KY05130104-006	BIG SOUTH FORK	50	pH	KDOW-BIO, 1992-93	MONITORED	WAH-T
KY05130104-007	ROCK CREEK	50 51 52 57	pH, MET, SO_4, SED	KNPS, 1987; KDOW-IS, 1988-89	MONITORED	WAH, PCR
KY05130104-008	ROARING PAUNCH CREEK	51 52 57	pH, Cl, TDS, SED, SO_4, MET	KNPS, 1987; KDOW-IS, 1991; KDFWR, 1993	MONITORED	WAH, PCR
KY05130104-009	BEAR CREEK	51 52	pH	KDOW-IS/NPS, 1991	MONITORED	WAH, PCR
KY05130104-019	CANE BRANCH	51	pH, MET	USFS, 1987-93	MONITORED	WAH
KY05130105-003	ILLWILL CREEK	55 21 14 11 13	Cl, TDS, NUTR, BACT, SED	KNPS, 1987; TN TECH, 1989; KDFWR, 1993	MONITORED	WAH-T
LAKES						
KY05130101-006L01	CORBIN RESERVOIR	10	NUTRIENTS	KDOW, 1988b; KDOW-LAKE, 1990	MONITORED	DWS
KY05130101-038L02	CRANKS CREEK LAKE	50	pH	KDOW-LAKE, 1990	MONITORED	WAH, SCR
KY05130102-005L01	WOOD CREEK LAKE	65 10	NUT	KDOW-LAKE, 1989	MONITORED	WAH-P

SALT RIVER BASIN

KY05140102-002	POND CREEK	40 65 71 90	BACT, SED, ORG, MET	KDOW-BIO, 1992-93; USGS/MSD, 1992-93; KDFWR, 1993	MONITORED	WAH, PCR
KY05140102-003	MILL CREEK	65	Cl, ORG	KDOW-IS, 1993	MONITORED	WAH-P
KY05140102-005	SALT RIVER	10 12 40 32 65	BACT,NUT,SED,ORG,DO	KNPS, 1987; KDOW-AMB, 1990-93; KDOW-IS, 1988-89; KDOW-BIO, 1992-93	MONITORED	PCR, WAH-P
KY05140102-007	FLOYDS FORK	40 65	BACT, SED, MET	USGS/MSD, 1992-93	MONITORED	WAH-P, PCR
KY05140102-008	CEDAR CK & PENN. RN	40 65	BACT, SED, MET	USGS/MSD, 1992-93	MONITORED	WAH-P, PCR
KY05140102-009	BROOKS RUN	40	BACT, ORG	KDOW, 1993	EVALUATED	WAH, PCR
KY05140102-010	CHENOWETH RUN	40	BACT, SED, NUT, MET	USGS/MSD, 1992-93	MONITORED	WAH, PCR

Nonpoint Source Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES 1 2 3 4 5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED*
KY05140102-011	FLOYDS FORK	40 65 74 32 14	BACT,SED,MET,NUT,ORG	KNPS SURVEY, 1987; USGS,1991; USGS/MSD, 1992-93	MONITORED	WAH, PCR-P
KY05140102-012	CANE RUN	10 40 65 90	BACT, ORG, MET	KDOW, 1990a; USGS/MSD, 1992-93	MONITORED	WAH-P, PCR
KY05140102-012	LONG RUN	10 40 65	BACT, ORG, MET	USGS, 1991; USGS/MSD, 1992-93	MONITORED	WAH-P, PCR
KY05140102-012	POPE LICK CREEK	10 40 65	BACT, ORG, MET	USGS, 1991; USGS/MSD, 1992-93	MONITORED	PCR
KY05140102-014	FLOYDS FORK	40 65 10	ORG, MET	KDFWR, 1993	EVALUATED	PCR
KY05140102-015	SALT RIVER	10 11 18 32	NUTR, SED, ORG, DO, BACT	KNPS, 1987; KDOW,1990b	EVALUATED	WAH-P
KY05140102-024	SALT RIVER	10	NUTR, ORG, DO	KDOW, 1988-89	EVALUATED	WAH-P
KY05140102-026	BEECH CREEK	16 18 14 19 65	BACT, SED, NUTR	KNPS, 1987; KDOW-NPS,1990	MONITORED	PCR
KY05140102-027	CROOKED CREEK	90	BACTERIA	KDOW-NPS,1990	MONITORED	PCR
KY05140102-028	ASHES CREEK	16 18 14	BACTERIA	KDOW-NPS,1990	MONITORED	PCR
KY05140102-028	JACKS CREEK	16 18 14 19	BACT, SED, NUTR, MET	KNPS, 1987; KDOW-NPS,1990	MONITORED	PCR
KY05140102-028	TIMBER CREEK	16 18 14 19	BACTERIA	KNPS, 1987; KDOW, 1988b; KDOW-NPS, 1990	MONITORED	PCR
KY05140102-029	SALT RIVER	16 18 14 65 19	BACT, NUTR, SED, TSS	KDOW-NPS/AMB, 1990-93; KDOW-BIO, 1992-93	MONITORED	PCR-P,WAH-P
KY05140102-031	SALT RIVER	16 18 14 65 32	BACT, SED, MET	KNPS, 1987; KDOW-NPS,1990	MONITORED	PCR
KY05140102-033	SALT RIVER	16 18 40	BACT, SED, MET	KNPS, 1987; KDOW-NPS,1990	MONITORED	PCR
KY05140103-001	ROLLING FORK	40 10 16 18 14	BACT, SED, NUTR	KNPS, 1987; USGS, 1990-93; KDOW-AMB, 1992-93	MONITORED	PCR
KY05140103-005	ROLLING FORK	40 10 16 18 14	BACT, SED, NUTR	KNPS,1987; KDOW-AMB,1990-93;KDOW-BIO,1992	MONITORED	PCR
KY05140103-012	BEECH FORK	10	BACTERIA	KNPS, 1987; KDOW-AMB, 1990-93; KDOW-BIO, 1992-93	MONITORED	PCR-P
LAKES						
KY05140101-006L01	LAKE JERICHO	10	NUTRIENTS	KDOW-LAKE, 1990-92	MONITORED	WAH-P
KY05140102-021L01	GUIST CREEK LAKE	10 65	NUTRIENTS	KDOW, 1986c; KDOW-LAKE, 1990	MONITORED	DWS-P, WAH-P
KY05140102-022L01	SHELBY LAKE	10	NUTRIENTS	KDOW, 1988b; KDOW-LAKE, 1991	MONITORED	WAH-P
KY05140102-025L01	TAYLORSVILLE LAKE	10 11 14 16 32	NUTR, BACT, SED	KNPS, 1987; USACOE, 1992; KDOW-LAKE, 1993	MONITORED	WAH-P
OHIO RIVER MINOR TRIBUTARIES						
KY05140101-001	MILL CREEK	40 30 60 10	BACT, SED, MET	KNPS, 1987; USGS, 1991-93; MSD, 1992-93; KDFWR, 1993	MONITORED	PCR, WAH
KY05140101-001	BIG RUN	40	ORG	KDFWR, 1993	EVALUATED	WAH
KY05140101-001	UNNAMED TRIB. TO MILL CREEK	40	ORG	KDFWR, 1993	EVALUATED	WAH
KY05140101-002	BEARGRASS CREEK	40 65 32	ORG, MET, SED	KNPS, 1987; KDFWR, 1993; USGS/MSD, 1988-93	MONITORED	WAH, PCR

Nonpoint Source Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES 1 2 3 4 5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED*
KY05140101-002	MIDDLE FK BEARGRASS CREEK	40	ORG, MET, DO	USGS, 1991	MONITORED	PCR, WAH
KY05140101-002	SOUTH FK BEARGRASS CREEK	40	ORG, MET, DO	USGS, 1991	MONITORED	PCR, WAH-P
KY05140101-002	MUDDY FK BEARGRASS CK	40	ORG, MET	USGS, 1991	MONITORED	PCR
KY05140101-003	GOOSE CR & LITTLE GOOSE CR	40 65	ORG, MET	USGS/MSD, 1992-93	MONITORED	WAH-P, PCR
KY05140101-004	HARRODS CREEK	40 65 10	ORG, MET	KNPS SURVEY, 1987; USGS/MSD, 1992-93	MONITORED	WAH, PCR

GREEN RIVER BASIN

KY05110001-010	NOLIN RIVER	18 11 32 21 16	BACT, NUTR, SED	KNPS SURVEY, 1987; KDOW-AMB, 1992-93	MONITORED	PCR-P
KY05110001-012	VALLEY CREEK	40 11 15 18 32	ORG,DO,Cl,TDS,NUT,SED,BACT	KNPS, 1987; KDOW-BIO, 1988; KDFWR, 1993	EVALUATED	WAH
KY05110001-026	LITTLE PITMAN CREEK	10 62 11 64 65	Cl, TDS, BACT, SED	KNPS, 1987; KDOW-IS, 1991	MONITORED	WAH-P
KY05110001-028	SOUTH FORK RUSSELL CREEK	55	Cl, TDS	KDOW-IS, 1993	MONITORED	WAH-T
KY05110002-012	DOTY CREEK	16 14 18	BACT, NUTR	KDOW-NPS, 1990-93	MONITORED	PCR, WAH-P
KY05110002-018	PATOKA CREEK	16 14 18	BACT, NUTR	KDOW-NPS, 1990-91	MONITORED	PCR
KY05110003-002	LEWIS CREEK	50 51 10	pH, MET, SO_4, Fe, SED	KNPS, 1987; KDOW, 1981; KDFWR, 1993	EVALUATED	WAH, PCR
KY05110003-003	CANEY CREEK	50	pH, METALS	KDOW-IS, 1981	EVALUATED	WAH-P,PCR-P
KY05110003-003	POND CREEK	51 57 52 11 40	pH, MET, SED, SO_4, Fe	KNPS, 1987; KDOW-IS, 1981; KDFWR, 1993	EVALUATED	WAH, PCR
KY05110003-005	MUD RIVER	90	SED, MET, SO_4	KNPS SURVEY, 1987; KDOW-AMB, 1992-93	MONITORED	WAH, PCR
KY05110003-008	MUD RIVER	11 14 51 18 66	SED, MET, SO_4, ORG	KNPS, 1987; KDOW-AMB, 1990-91	MONITORED	WAH
KY05110005-001	GREEN RIVER	10 40 55 11	BACT, MET, SED, Cl	KNPS, 1987; ORSANCO, 1990-93; USGS-NAWQA, 1992-93	MONITORED	PCR
KY05110005-003	GREEN RIVER	10 40 55 11	BACT, MET, SED, Cl	KNPS, 1987; ORSANCO, 1990-93; USGS-NAWQA, 1992-93	MONITORED	PCR
KY05110005-009	NORTH FORK PANTHER CREEK	10 70 11 80 14	SEDIMENT	KNPS, 1987; KDFWR, 1987; KDFWR, 1993	EVALUATED	WAH
KY05110005-010	SOUTH FORK PANTHER CREEK	10 70 11 80 14	SEDIMENT	KNPS, 1987; KDFWR, 1987; KDFWR, 1993	EVALUATED	WAH
KY05110005-011	GREEN RIVER	10 40 55 11 80	BACT,MET, SED, NUTR, Cl, SO_4	KNPS, 1987; ORSANCO, 1990-93	MONITORED	PCR
KY05110005-016	BUCK CREEK	58 51 16 11 13	pH, ORG, NUTR, Cl	KNPS, 1987; HLTH DEPT, 1987; ASCS, 1987; KDFWR, 1993	EVALUATED	WAH, PCR
KY05110005-016	WEST FORK BUCK CREEK	58 51 16 11 13	pH, ORG, NUTR, Cl	KNPS, 1987; HLTH DEPT, 1987; ASCS, 1987; KDFWR, 1993	EVALUATED	WAH, PCR
KY05110006-001	POND RIVER	51 10 71 11 90	SED,NUTR,pH,MET,SO_4,Fe	KNPS, 1987; KDOW, 1981; KDOW-AMB, 1990-93; KDFWR, 1993	MONITORED	WAH-P
KY05110006-002	CYPRESS CREEK	50 51 13 14 16	pH,SED,NUTR,SO_4,BACT,MET	KNPS, 1987; KDOW-IS, 1982; KDFWR, 1993	EVALUATED	WAH, PCR

Nonpoint Source Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES 1 2 3 4 5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED*
KY05110006-002	HARRIS BRANCH	50	pH	KDOW-IS, 1982	EVALUATED	WAH, PCR
KY05110006-005	FLAT CREEK	50 51 57 11	pH, SED, MET, SO_4	KNPS, 1987; KDOW-IS, 1982	EVALUATED	WAH, PCR
KY05110006-006	DRAKES CREEK	50 11 51 80 74	pH, SED, SO_4, Fe[1]	KNPS, 1987; KDOW-IS, 1982	EVALUATED	WAH, PCR
LAKES						
KY05110001-022L01	METCALFE COUNTY LAKE	10 86	NUTRIENTS	KDOW-LAKE, 1990	MONITORED	WAH-P,SCR-P
KY05110001-026L01	CAMPBELLSVILLE RESERVOIR	10	NUTRIENTS	KDOW, 1988b; KDOW-LAKE, 1990	MONITORED	WAH-P,SCR-P
KY05110003-007L01	SPA LAKE	10	NUTRIENTS	KDOW-LAKE,1990	MONITORED	WAH-P

LOWER CUMBERLAND AND TRADEWATER RIVER BASINS

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES 1 2 3 4 5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED*
LOWER CUMBERLAND RIVER BASIN						
KY05130205-008	LITTLE RIVER	10 11 14 16 21	SED, NUTR, BACT, MET	KNPS,1987; KDOW-IS,1988; KDOW-AMB,1990-91; KDOW-BIO, 1992-93	MONITORED	WAH-P
KY05130205-009	NORTH FORK LITTLE RIVER	40 10 11 31 32	BACT, SED	KNPS, 1987; KDOW-IS, 1988	EVALUATED	PCR
KY05130205-010	SOUTH FORK LITTLE RIVER	10 11 31 32 80	SED, NUTR	KNPS, 1987; KDOW-IS, 1988	EVALUATED	WAH-P
KY05130205-011	SINKING FORK	10 11 14 16 21	SED, NUTR, BACT	KNPS, 1987; KDOW-IS, 1988	EVALUATED	WAH-P
KY05130206-002	ELK FORK	10 11 14 40 80	DO, BACT, SED, NUT, MET	KNPS, 1987; KDOW-IS, 1982	EVALUATED	WAH
LAKES						
KY05140203-004L01	LAKE GEORGE	10	NUTRIENTS	KDOW-LAKE, 1990	MONITORED	WAH-P
KY05140205-008L01	LAKE PEWEE	10 90	NUTRIENTS	KDOW-LAKE, 1990	MONITORED	DWS-P
KY05140205-008L02	LOCH MARY LAKE	50	MET, INORGANICS	KDOW-LAKE, 1990	MONITORED	DWS
TRADEWATER RIVER BASIN						
KY05140205-001	TRADEWATER RIVER	50 10 11 30 51	SED, ORG/DO, MET,pH,SO_4,COND	KNPS, 1987; KDOW-IS, 1981; KDOW-AMB,1992-93	MONITORED	WAH-P
KY05140205-002	CYPRESS CREEK	50 10	pH, SEDIMENT	KDOW-IS, 1981	EVALUATED	WAH-P,PCR-P
KY05140205-002	SMITH DITCH	50 10 11 14 51	pH,SED,NUT,MET,SO_4	KNPS, 1987; KDOW-IS, 1981	EVALUATED	WAH-P,PCR-P
KY05140205-003	CRAB ORCHARD CREEK	50 10 11 51 52	pH, MET, SED, SO_4	KNPS, 1987; KDOW-IS, 1981	EVALUATED	WAH, PCR
KY05140205-003	VAUGHN DITCH	50 10	pH,MED,SED,SO_4	KDOW-IS, 1981	EVALUATED	WAH
KY05140205-008	CLEAR CREEK	50 10 51 11 55	pH, SED, SO_4, COND	KDOW, 1987; KDOW-IS, 1981	EVALUATED	WAH, PCR
KY05140205-008	LICK CREEK	50 10	pH, SED	KDOW-IS, 1981	EVALUATED	WAH, PCR
KY05140205-008	WEIRS CREEK	50 10	pH, SED	KDOW-IS, 1981	EVALUATED	WAH-P,PCR-P
KY05140105-009	TRADEWATER RIVER	50 10 11 74 21	DO, SED, MET, SO_4	KNPS,1987;KDOW-IS,1981;KDOW-AMB,1990-91	MONITORED	WAH-P

Nonpoint Source Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES 1 2 3 4 5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED*
KY05140205-012	TRADEWATER RIVER	50 10 11 74 21	DO, SED, MET, SO_4	KNPS,1987;KDOW-AMB/BIO,1990-91	MONITORED	WAH-P
KY05140205-015	CANEY CREEK	51 10 80 74 11	pH, SED, SO_4, COND	KNPS, 1987; KDOW-IS, 1981	EVALUATED	PCR, WAH
KY05140205-016	BUFFALO CREEK	50 10 51 80 74	pH, SED, SO_4, COND	KNPS, 1987; KDOW-IS, 1981	EVALUATED	WAH, PCR
OHIO RIVER MINOR TRIBUTARIES						
KY05140202-006	CANOE CREEK	10 70 40 11 55	SEDIMENT, Cl	KNPS, 1987; KDFWR, 1987	EVALUATED	WAH-P

TENNESSEE AND MISSISSIPPI RIVER BASINS

WATERBODY CODE	STREAM NAME	N.P.S. CATEGORIES 1 2 3 4 5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED*
TENNESSEE RIVER BASIN						
KY06040006-006	CLARKS RIVER	10 11	NUTR, SED, TSS	KDOW-AMB, 1990-93; KDOW-BIO, 1992-93	MONITORED	WAH-P
KYO6040006-013	CYPRESS CREEK	40	PCB	KDOW-IS, 1987	EVALUATED	WAH
OHIO RIVER MINOR TRIBUTARIES						
KY05140206-001	HUMPHREY BRANCH	90 10	SED	KDOW-IS, 1984	EVALUATED	WAH-P
KY05140206-001	HUMPHREY CREEK	10 70	SED	KDOW-IS, 1984	EVALUATED	WAH-P
KY05140206-002	LITTLE BAYOU CREEK	66 11 14 32 40	ORG,PCB,SED,MET,NUTR,BACT	KNPS SURVEY, 1987; UK, 1989	MONITORED	WAH

* - P = partial support, - T = threatened

Nonpoint Source Impacted Groundwaters

HYDROLOGIC SYSTEM	COUNTY OR REGION	NPS CATEGORIES 1 2 3 4 5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED OR EVALUATED
ALLUVIAL AQUIFER NEAR CALVERT CITY	MARSHALL	60 62 63 64 65	MET, VOC, PEST	KDOW, 1988a	EVALUATED
ALLUVIAL AQUIFER NEAR LOUISVILLE	JEFFERSON	90	ORGANICS	DAVIS & MTHWS, 1983	EVALUATED
ALLUVIAL G'WATER SYSTEMS OVERLYING PENNSYLVANIAN SHALE, LIMESTONE, & SANDSTONE	DAVIESS, HOPKINS	10 11 12 18 19	PEST, NUTR, NO_3, TSS, BACT	UK, 1991	MONITORED
ANVIL AQUIFER	UNION	52 86	Fe, SO_4, TDS, TSS	FICKLE, 1991	EVALUATED
AQUIFER NEAR BANDANA	BALLARD	10 65	NITRATES	KDOW-GW, 1994	MONITORED
AQUIFER NEAR RUSSELLVILLE	LOGAN	64 66 61	PCB, METALS	HAZTECH, 1986	EVALUATED
AUBURN MUNICIPAL SPRING	LOGAN	10 11 13	TSS, SED, PEST	KDOW-GW, 1991-92	MONITORED
BIG SINKING OIL FIELD AQUIFERS	ESTILL, POWELL, LEE, WOLFE	55	pH,COND,TDS,Cl,Br,SO_4,Na,Ca,TOC	SMC MARTIN, 1983	EVALUATED
BLUE HOLE SPRING	ROCKCASTLE	10 40	TSS, SED, PEST	KDOW-GW, 1991-92	MONITORED
CENTRAL KENTUCKY KARST REGION	CENTRAL KY KARST REGION	65	BACTERIA	QUINLAN & ROWE,1977	EVALUATED
CHLOE CREEK GROUNDWATER BASIN	PIKE	52	ACID	KDOW, 1986d	EVALUATED
DOUBLE SINK GROUNDWATER BASIN	EDMONSON	10 20	SED, PEST	LEITHEUSER, 1988	EVALUATED
DRAKES CREEK KARSTIC AQUIFER	SIMPSON	60	PCB	CRAWFORD, 1985	EVALUATED
ELIZABETHTOWN SPRING GROUNDWATER BASIN	HARDIN	10 40	TSS, PEST, SED	KDOW-GW, 1991-92	MONITORED
GARRETT SPRING	JESSAMINE, WOODFORD	11 12 13 14 20	TSS,COND,Ca,Mg,Cl,NO_3,SO_4,BACT	UK WRRI, 1990	MONITORED
GARRETT SPRING GROUNDWATER BASIN	JESSAMINE, WOODFORD	32 68	TSS, SED, BACT	UK, 1991	MONITORED
GATEWAY A.D.D. AQUIFER	ROWAN,MONT.,BATH,MEN.,MORGAN	11 65	BACTERIA	KDOW & KGS, 1988	EVALUATED
GREEN HILLS WATER DISTRICT SPRING	HARLAN	51	TSS, SED	KDOW-GW, 1991-92	MONITORED
G'WATER IN LOESS OVERLYING COASTAL PLAIN DEPOSITS-PURCHASE PHYSIOGRAPHIC REGION	HICKMAN	10 11 12 18 19	PEST, NUTR, NO_3, BACT	UK, 1991	MONITORED
HARRIS SPRINGS GROUNDWATER BASIN	WARREN	30 40	SED, TDS, TSS	WARREN CO. CD., 1991	EVALUATED
HIDDEN RIV. G'WATER BASIN NEAR HORSE CAVE	HART	64 65	CYANIDE, METALS	KDOW, 1986d	EVALUATED

Nonpoint Source Impacted Groundwaters (Cont'd.)

HYDROLOGIC SYSTEM	COUNTY OR REGION	NPS CATEGORIES 1 2 3 4 5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED OR EVALUATED
INNER BLUEGRASS KARST AQUIFERS	AND.,BOYLE,BOUR.,CLARK,FAY.,FRAN GAR.,JESS.,MAD.,MER.,SCOTT,WOOD.	10 40	BACT, NITRATES	SCANLON, 1985	EVALUATED
LOST RIVER	WARREN	32 40 61 62 63	ORG, VOC, FUEL	CRAWFORD, 1982 & 1986	EVALUATED
LOUISVILLE AQUIFER	JEFFERSON	65	BACTERIA	USEPA, 1981 - 1982	EVALUATED
MAMMOTH CAVE REGION GROUNDWATER BASIN	EDM.,HART,BARREN,WARR,GRAYSON	16 18 19 11 55	NUT,SED,PEST,BACT,NO_3,Cl	USEPA, 1981; KDOW-NPS, 1991a; NPS, 1991; NPS 1990-94	MONITORED
McCOY BLUE SPRING GROUNDWATER BASIN	HART, BARREN, EDMONSON	10 20 55	SED, PEST, Cl	LEITHEUSER, 1988	EVALUATED
MILL CREEK GROUNDWATER BASIN	JEFFERSON	65	BACTERIA	USEPA, 1982	EVALUATED
MILL HOLE SUBBASIN OF TURNHOLE SPR. BASIN	BARREN, EDMONSON	55 10 20	SO_4, Cl, COND, TSS	QUINLAN & ROWE, 1978; KDOW-NPS, 1991a	EVALUATED
MISSISSIPPIAN KARST G'WATER SYSTEMS OF THE WESTERN PENNYROYAL PHYSIOG. REGION	LOGAN, TODD	10 11 12 18 19	PEST, NUTR, NO_3, TSS, BACT	UK, 1991	MONITORED
MISSISSIPPIAN LIMESTONE G'WATER SYSTEMS OF THE EASTERN PENNYROYAL PHYSIOG. REGION	RUSSELL	10 11 12 18 19	PEST, NUTR, NO_3, TSS, BACT	UK, 1991	MONITORED
NORTH FORK KENTUCKY RIVER GWATER BASIN	LEE, BREATHITT, PERRY	51	METALS, ACID	DYER, 1983	EVALUATED
OHIO R. ALLUVIAL AQUIFER; PIRTH SPR. & HEAD OF ROUGH SPR. G'WATER BASINS	HARDIN	10 30 60	TSS, Cl, SO_4, OIL-GREASE, COND, Na, Ca, Fl, FUEL, ALK	USGS, 1990	EVALUATED
OHIO VALLEY ALLUVIAL AQUIFER	HANCOCK	60	Fl, CYANIDE	ENV. RES. MGT, 1980	EVALUATED
ORDOVICIAN KARST GROUNDWATER SYSTEMS OF THE INNER BLUEGRASS PHYSIOGRAPHIC REGION	BOURBON, JESSAMINE, WOODFORD	10 11 12 18 19	PEST, NUTR, NO_3, TSS, BACT	UK, 1991	MONITORED
ORDOVICIAN KARST GROUNDWATER SYSTEMS OF THE OUTER BLUEGRASS PHYSIOGRAPHIC REGION	FLEMING, SHELBY	10 11 12 18 19	PEST, NUTR, NO_3, TSS, BACT	UK, 1991	MONITORED
PIKE SPRING GROUNDWATER BASIN	HART, BARREN, EDMONSON	10 20	SED, PEST	LEITHEUSER, 1988	EVALUATED
PIRTLE SPRING GROUNDWATER BASIN	HARDIN	10 11	TSS, SED, PEST	KDOW-GW, 1991-92	MONITORED
PLEASANT GROVE SPRING BASIN	LOGAN	11 18 14 65 71	NUTR, SED, PEST, BACT, NO_3	UK, 1991; KGS, 1994	MONITORED
RIO VERDE SPRING	HART	40	TSS, SED	KDOW-GW, 1991-92	MONITORED

Nonpoint Source Impacted Groundwaters (Cont'd.)

HYDROLOGIC SYSTEM	COUNTY OR REGION	NPS CATEGORIES 1 2 3 4 5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED OR EVALUATED
ROYAL SPRING AQUIFER	SCOTT	10 16 18 30 40	BACT, PEST, TSS, SED	ROSS, et al., 1978; KDOW-GW, 1991-92	MONITORED
SLOANE VALLEY KARSTIC AQUIFER	PULASKI	61 63 51	METALS	FERRY, 1984	EVALUATED
SUDS SPRING GROUNDWATER BASIN	HART, BARREN, EDMONSON	10 20 55	SED, PEST, Cl	LEITHEUSER, 1988	EVALUATED
TURNHOLE SPRING GROUNDWATER BASIN	EDMONSON, BARREN	10 20	SED, PEST	LEITHEUSER, 1988; KDOW-NPS, 1991a	EVALUATED
UNNAMED AQUIFER	LIVINGSTON,MARSHALL,McCRACKEN	10 65	BACT, NITRATES	KDOW, 1988a	EVALUATED
UNNAMED GROUNDWATER BASIN	JOHNSON & MARTIN	52	METALS, ACID	MULL, ET AL., 1981	EVALUATED
UNNAMED GROUNDWATER BASIN	CHRISTIAN	90	BACTERIA	MUENDEL, 1980	EVALUATED
UNNAMED GROUNDWATER BASIN	JEFFERSON	65	BACTERIA	USEPA, 1983	EVALUATED
UNNAMED GROUNDWATER BASINS	FLOYD, HARLAN, PIKE, WHITLEY	51	TSS,TDS,SO_4,pH,Fe,ALK,COND	KGS, 1991	MONITORED
UNNAMED G/W BASIN NEAR BOWLING GREEN	WARREN	90	ORGANICS	KDOW, 1986d	EVALUATED
UNNAMED G'WATER BASIN NEAR PRINCETON	CALDWELL	90	INORGANICS	PLEBUCH, 1976	EVALUATED
UNNAMED GROUNDWATER SITE	MAGOFFIN	90		PEAK AND THIERET	EVALUATED
UNNAMED GROUNDWATER SITE	MONTGOMERY	90	OIL-GREASE	KDOW, 1986d	EVALUATED
UNNAMED G/W SITE NEAR BRUSHY ELEM SCH.	PIKE	90	FUEL	DOW, 1986d	EVALUATED
UNNAMED GWATER SITE NEAR CAMPBELLSVILLE	TAYLOR	90	FUEL	KDOW, 1986d	EVALUATED
UNNAMED G'WATER SITE NEAR ELIZABETHTOWN	HARDIN	84	INORGANICS	LAMBERT, 1979	EVALUATED
UNNAMED G'WATER SITE NEAR ELIZABETHTOWN	HARDIN	90	ORGANICS	MULL & LYVERSE,1984	EVALUATED
UNNAMED G'WATER SITE NEAR ELIZABETHTOWN	HARDIN	10	NUTRIENTS	DOW, 1986d	EVALUATED
UNNAMED G'WATER SITE NEAR FORT KNOX	HARDIN	90	FUEL	DOW, 1986d	EVALUATED
UNNAMED G'WATER SITE NEAR FRANKFORT	FRANKLIN	90	FUEL	DOW, 1986d	EVALUATED
UNNAMED GROUNDWATER SITE NEAR I-65	HART	82	OIL-GREASE	DOW, 1986d	EVALUATED
UNNAMED G'WATER SITE NEAR LEXINGTON	FAYETTE	90	FUEL	DOW, 1986d	EVALUATED
UNNAMED G'WATER SITE NEAR LEXINGTON	FAYETTE	90	ORGANICS	FAUST, 1980	EVALUATED
UNNAMED GROUNDWATER SITE NEAR LIGON	FLOYD	90		KY FAIR TAX COALITION, 1983	EVALUATED

Nonpoint Source Impacted Groundwaters (Cont'd.)

HYDROLOGIC SYSTEM	COUNTY OR REGION	NPS CATEGORIES 1 2 3 4 5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED OR EVALUATED
UNNAMED G'WATER SITE NEAR LOUISVILLE	JEFFERSON	90	FUEL	DOW, 1986d	EVALUATED
UNNAMED-IN DOUBLE SPRINGS DRAINAGE BASIN	WARREN	65	BACTERIA	SCHINDEL, 1984	EVALUATED
UNNAMED KARST AQUIFERS	BOUR.,CLARK,FAY.,JESS.,SCOTT,WOOD	10	TSS,PEST,COND,NO_3,SO_4,Cl	USGS, 1977	EVALUATED
UNNAMED KARST AQUIFERS	WARR,HARDIN,HART,PUL.,EDMONSON	40	ORGANICS	CRAWFORD & GRAVE, 1984	EVALUATED
UNNAMED SPRING GROUNDWATER BASIN	HART, BARREN, EDMONSON	10 20 55	SED, PEST, Cl	LEITHEUSER, 1988	EVALUATED

• COUNTY ABBREVIATIONS •

AND. = ANDERSON
BOUR. = BOURBON
EDM. = EDMONSON
FAY. = FAYETTE
FRAN. = FRANKLIN
GAR. = GARRARD
JESS = JESSAMINE
MAD. = MADISON
MEN. = MENIFEE
MER. = MERCER
MONT. = MONTGOMERY
PUL. = PULASKI
WARR. = WARREN
WOOD. = WOODFORD

Nonpoint Source Impacted Wetlands

HYDRO-LOGIC CODE	WETLANDS NAME (RIVER BASIN)	COUNTY	NPS CATEGORIES 1 2 3 4 5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED
05070201	BEAR CREEK (BIG SANDY)	PIKE	51	SED, pH, MET, COND, SO_4, Na	KNPC, 1979	EVALUATED
05070202	ELKHORN CREEK (BIG SANDY)	PIKE	51	SED, COND, SO_4, MET, Na	KNPC, 1979	EVALUATED
05070203	JENNY CREEK (BIG SANDY)	JOHNSON	51 52	COND, SO_4, MET, Na, SED	KNPC, 1979	EVALUATED
05070203	LEVISA FORK (BIG SANDY)	JOHNSON	51 52	SED, COND, SO_4, MET, ALK	KNPC, 1979	EVALUATED
05070203	RIGHT FK BEAVER CK (BIG SANDY)	FLOYD	51	COND, SO_4,Na, METALS	KNPC, 1979	EVALUATED
05070203	ROCKCASTLE CREEK (BIG SANDY)	MARTIN	51 52	SED, MET, SP COND, SO_4, Na	KNPC, 1979	EVALUATED
05070203	SPURLOCK CREEK (BIG SANDY)	FLOYD	51 52 50	SO_4, METALS, Na, pH, SED	KNPC, 1979	EVALUATED
05070204	BLAINE CREEK (BIG SANDY)	LAWRENCE	55 51 71	COND, METALS, Cl, Na	KNPC, 1979	EVALUATED
05090103	SCHULTZ CREEK (OHIO)	GREENUP	31	SEDIMENT	KDOW, 1991a	EVALUATED
05090104	EAST FORK LITTLE SANDY RIVER	BOYD	51	SP COND, SO_4, Na, MET	KNPC, 1979	EVALUATED
05100101	LICKING RIVER	MAGOFFIN	51 10 16 71	SED, NUT, SO_4, MET, COND	KNPC, 1979	EVALUATED
05100201	BUCHHORN CREEK (KENTUCKY)	BREATHITT	51	METALS, SO_4, SP COND	KNPC, 1979	EVALUATED
05100201	CARR FORK (KENTUCKY)	KNOTT	51 52	SED, MET, SO_4, Na, SP COND	KNPC, 1979	EVALUATED
05100201	SQUABBLE CREEK (KENTUCKY)	PERRY	51 71 62	SED,SO_4,MET,Na,COND,BACT,NUT	KNPC, 1979	EVALUATED
05100201	TROUBLESOME CREEK (KENTUCKY)	PERRY	51	SP COND, SO_4, MET, Na	KNPC, 1979	EVALUATED
05100203	BUCK CREEK (KENTUCKY)	OWSLEY	51 10	SEDIMENT, SO_4, METALS	KNPC, 1979	EVALUATED
05100203	GOOSE CREEK (KENTUCKY)	CLAY	51	SEDIMENT	KNPC, 1979	EVALUATED
05100204	STURGEON CREEK (KENTUCKY)	LEE	51 10	SEDIMENT	KNPC, 1979	EVALUATED
05110003	BEECH CREEK (GREEN)	MUHLENBERG	51 71 76 78	SED, pH, SP COND, SO_4, DO	USEPA, 1990	MONITORED
05110003	BIG MUDDY CREEK (GREEN)	BUTLER	11 70	SEDIMENT	KDOW, 1991a	EVALUATED
05110003	BULL RUN (GREEN)	OHIO	11 70	SED, TSS	USEPA, 1990	EVALUATED
05110003	DOOLIN LAKE SWAMP	BUTLER	20	SEDIMENT	KNPC, 1980b	EVALUATED
05110003	GREEN RIVER	MUHL., BUTLER, OHIO	11 78	TSS, SED	USEPA, 1990	EVALUATED
05110003	LEWIS CREEK (GREEN)	OHIO, MUHLENBERG	51	TSS, SO_4, MET, COND, pH	USEPA, 1990; MITSCH, et al., 1983	MONITORED
05110003	LITTLE MUDDY CREEK SWAMP	BUTLER	20	SEDIMENT	KNPC, 1980b	EVALUATED
05110003	MUD RIVER (GREEN)	BUTLER, LOGAN	14 55	Cl, SED	USEPA, 1990; KNPC, 1981	EVALUATED
05110003	POND CREEK (GREEN)	OHIO, MUHLENBERG	51 71 76 78 21	SED,COND,pH,SO_4,DO,MET,Fe,ACID	USEPA, 1990; MITSCH, et al., 1983; KNPC, 1980b & 1981	MONITORED
05110003	ROCKY CREEK (GREEN)	MUHLENBERG	51	SO_4	USEPA, 1990; KNPC, 1981	MONITORED
05110004	MUDDY CREEK (GREEN)	OHIO, BUTLER	21 71 65 51 10	SED, BACT, SO_4, PEST, Cl,	USEPA, 1990; KNPC, 1981 & 1980b	MONITORED
05110004	ROCK HOUSE SLOUGH (GREEN)	OHIO	10 74	SEDIMENT	KNPC, 1980b	EVALUATED
05110004	UNNAMED WETLAND-E OF DUNDEE	OHIO	20 74	SEDIMENT	KNPC, 1980b	EVALUATED
05110004	UNNAMED WETLAND-SW OF DUNDEE	OHIO	70 74 20 51 55	SEDIMENT	KNPC, 1980b	EVALUATED
05110005	ABE CREEK WETLANDS	McLEAN	20 74 71	SEDIMENT	KNPC, 1980b	EVALUATED
05110005	BUCK CREEK SWAMP	McLEAN	10	SEDIMENT	KNPC, 1980b	EVALUATED

Nonpoint Source Impacted Wetlands (Cont'd.)

HYDRO-LOGIC CODE	WETLANDS NAME (RIVER BASIN)	COUNTY	NPS CATEGORIES 1 2 3 4 5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED
05110005	LONG FALLS CREEK (GREEN)	McLEAN	51 55 10 71	SP COND, Cl, SO_4, SED	KNPC, 1980b	EVALUATED
05110005	MOSLEYVILLE SLOUGH	DAVIESS	51 71 10	COND, SO_4, Fe, Mn	KDOW, 1981	EVALUATED
05110005	PANTHER CREEK WETLANDS (GREEN)	DAVIESS, OHIO	20 23 10 51	SEDIMENT	KNPC, 1980b; USEPA, 1990	EVALUATED
05110005	RICHMOND SLOUGH	DAVIESS, HENDERSON	55 11 14	SEDIMENT, Cl	KNPS SURVEY, 1987	EVALUATED
05110005	UNNAMED SLOUGH-ALONG KY 136	HENDERSON	55	SPECIFIC CONDUCTANCE, Cl	KNPC, 1981	EVALUATED
05110005	UNNAMED WETLANDS-W OF RACE CK	HENDERSON	11 14	SEDIMENT	KNPC, 1980b	EVALUATED
05110006	CYPRESS CREEK (GREEN)	McLEAN, MUHL	51 71 73 11 77	TSS,SO_4,pH,COND,Mn,Fe,ACID,SED	MITSCH, 1982 & 1985; BOSSERMAN, 1985; USEPA, 1990	MONITORED
05110006	DEER CREEK (GREEN)	WEBSTER	10 55 71 80	METALS, SOLID WASTE	KDOW, 1981; KNPC, 1980b	EVALUATED
05110006	DRAKES CREEK (GREEN)	HOPKINS, CHRISTIAN	51	pH, SP COND, SED, SO_4	MITSCH, et al., 1983; USEPA, 1990	MONITORED
05110006	FLAT CREEK WETLANDS	HOPKINS	50	SP COND, SO_4, BACT	USEPA,1990; KNPC, 1980b	MONITORED
05110006	FLAT CREEK (GREEN)	HOPKINS	51 52 57	SO_4, SP COND, pH	MITSCH, et al., 1983; KNPC, 1981	EVALUATED
05110006	ISAACS & IRWIN CREEKS (GREEN)	MUHLENBERG	51 70	SED, pH, COND, SO_4	USEPA, 1990	EVALUATED
05110006	JARRELLS CREEK (GREEN)	MUHLENBERG	20 11	SEDIMENT	USEPA, 1990	EVALUATED
05110006	LITTLE CYPRESS CREEK	OHIO	51 52 57	SP COND, SO_4, Fe, Mn	MITSCH, et al., 1983	EVALUATED
05110006	LOG CREEK (GREEN)	MUHLENBERG	11 70	SEDIMENT	USEPA, 1990	EVALUATED
05110006	LONG CREEK (GREEN)	MUHLENBERG	51 71 10	SEDIMENT	USEPA, 1990	EVALUATED
05110006	LONG POND (GREEN)	CHRIS.,MUHL,HOPK	51 52 57 11 76	SED, SP COND, MET	MITSCH, et al., 1983; KNPC, 1980 & 1981; KDOW, 1989	EVALUATED
05110006	OTTER CREEK (GREEN)	HOPKINS	11 51 71	SEDIMENT, TSS	USEPA, 1990	EVALUATED
05110006	PLEASANT RUN (GREEN)	HOPKINS	51	pH, COND, SED, SO_4	USEPA, 1990	MONITORED
05110006	POND RIVER WETLANDS	CHRIS,McLEAN,MUHL.	10 20 55	SEDIMENT	KNPC, 1980b	EVALUATED
05110006	ROUGH RIVER (GREEN)	OHIO	51	SO_4	KNPC, 1981	EVALUATED
05110006	THOMPSON CREEK (GREEN)	MUHLENBERG	51 57 71	SED,pH,TSS,SP COND,SO_4	USEPA, 1990; MITSCH, et al., 1983	EVALUATED
05110006	WEST FORK POND RIVER (GREEN)	CHRISTIAN	51 57 74 20	COND, SO_4, ALKALINITY, SED	MITSCH, et al., 1983; KNPC, 1980b & 1981	EVALUATED
05130101	BIG INDIAN CREEK (UPP. CUMBER)	KNOX	51 10 16	SED, SO_4, MET, Na, COND, NUT	KNPC, 1979	EVALUATED
05130101	CLEAR FORK (UPPER CUMBERLAND)	BELL	51 10	SED, SO_4, MET, SP COND	KNPC, 1979	EVALUATED
05130101	COLLIERS CREEK (UP. CUMBER.)	LETCHER	52	SED, MET, SP COND, ALK, Na	KNPC, 1979; KNPC, 1980a	EVALUATED
05130101	CRANKS CREEK (UPP. CUMBERL.)	HARLAN	51	pH, COND, MET, SO_4, TURB	KNPC, 1979	EVALUATED
05130101	LAUREL RIVER (UPP. CUMBERLAND)	LAUREL	50	SP COND, SO_4, METALS	KNPC, 1980a	EVALUATED
05130101	MARSH CREEK (UPPER CUMBERLAND)	McCREARY	51 52 10	pH, METALS, SEDIMENT	KNPC, 1980a	EVALUATED
05130101	ROAD FORK CREEK (UPP. CUMBER.)	KNOX	10 16 51	NUTRIENTS, SEDIMENT	KNPC, 1979	EVALUATED
05130104	BIG SOUTH FORK (UP. CUMBERLAND)	McCREARY	51	SEDIMENT, pH, SO_4	KNPC, 1980a	EVALUATED
05130104	KENNEDY CREEK (UP. CUMBERLAND)	WAYNE	55	Cl, Na	KNPC, 1980a	EVALUATED
05130104	LITTLE SOUTH FORK (UP. CUMBER.)	WAYNE	55	TDS, SPECIFIC CONDUCTANCE, Cl	KNPC, 1980a	EVALUATED

Nonpoint Source Impacted Wetlands (Cont'd.)

HYDRO-LOGIC CODE	WETLANDS NAME (RIVER BASIN)	COUNTY	NPS CATEGORIES 1 2 3 4 5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED
05130205	CANEY CREEK (LOWER CUMBERL.)	TRIGG	31	SEDIMENT	KDOW, 1991a	EVALUATED
05140101	NORTHERN DITCH (OHIO)	JEFFERSON	32 63 70	SEDIMENT	KDOW, 1991a	EVALUATED
05140202	GRASSY POND WETLANDS	HENDERSON	77 72 55	SEDIMENT, Cl	KNPS SURVEY, 1987	EVALUATED
05140202	HENDERSON SLOUGHS	HENDERSON, UNION	11 55	SEDIMENT, SP COND	BOSSERMAN, 1985; MITSCH, 1982; KNPC, 1980b	EVALUATED
05140202	LITTLE CYPRESS SLOUGH	HENDERSON	77 72 55	SEDIMENT, Cl	KNPS SURVEY, 1987	EVALUATED
05140202	OHIO RIVER WETLANDS	UNION	11	SEDIMENT	KNPC, 1980b	EVALUATED
05140202	UNNAMED SLOUGH - OHIO RIVER	HENDERSON	55	SPECIFIC CONDUCTANCE	KNPC, 1980b	EVALUATED
05140205	BROOKS CREEK (TRADEWATER)	CALD,HOPK,CRIT,WEB	51 52 57	SO_4, SP COND, SED	MITSCH, et al., 1983	EVALUATED
05140205	CANY CREEK (TRADEWATER)	HOPKINS	51 52 57	ACIDITY, SO_4, METALS	MITSCH, et al., 1983	EVALUATED
05140205	CLEAR CREEK (TRADEWATER)	HOPKINS	51 70 21 74	SED, TSS, pH, SO_4, COND, Fe, Mn	MITSCH, 1982 & 1985; BOSSERMAN, 1985; USEPA, 1990	MONITORED
05140205	COPPERAS CREEK (TRADEWATER)	HOPKINS	51	SEDIMENT, pH, COND	KDOW, 1991a	EVALUATED
05140205	FLOODPLAIN WETLANDS (T'WATER)	CRITTENDEN	11	SEDIMENT	KNPC, 1980b	EVALUATED
05140205	LAND BRANCH WETLANDS	CALDWELL	50 20 74	SEDIMENT	KNPC, 1980b	EVALUATED
05140205	LICK CREEK (TRADEWATER)	CALD,HOPK,CRIT,WEB	51 52 57 21 23	pH, SO_4, Fe, SEDIMENT	MITSCH, et al., 1983; KNPC, 1980b	EVALUATED
05140205	MONTGOMERY CREEK (TRADEWATER)	HOPK.,CALD.,CHRIS.	65 10 50	SEDIMENT	MITSCH, et al., 1983; KNPC, 1981	EVALUATED
05140205	OLNEY (TRADEWATER)	CALDWELL, HOPKINS	51 52 57	SEDIMENT, pH, METALS	MITSCH, et al., 1983; KNPC, 1981	EVALUATED
05140205	PROVIDENCE (TRADEWATER)	WEB., CRIT., HOPK.	51 52 57	SED, Mn, SO_4, Al, COND	MITSCH, et al., 1983	EVALUATED
05140205	SLOVER CREEK (TRADEWATER)	WEBSTER	51 70	SEDIMENT, TSS	USEPA, 1990	EVALUATED
05140205	UNNAMED (HURRICANE/T'WATER)	HOPK., CALD., CHRIS.	51	pH, DO, Fe	MITSCH, et al., 1983	EVALUATED
05140205	WEIRS CREEK (TRADEWATER)	HOPKINS	51 70 52 57 74	SED,TSS,pH,SO_4,COND,Fe, ACID	MITSCH, et al., 1983; KNPC, 1980b & 1981; USEPA, 1990	MONITORED
08010100	BURNT SLOUGH CREEK (MISS.)	BALLARD	11	SEDIMENT	KDOW, 1989	EVALUATED
08010201	BAYOU DE CHEIN WETLANDS (MISS.)	FULTON,HICK., GRAV.	11 18	SEDIMENT, NUTRIENTS, BACT	KDOW, 1989	EVALUATED
08010201	LITTLE BAYOU DE CHEIN WETLANDS	FULTON	11	SEDIMENT	KDOW, 1989	EVALUATED
08010201	MAYFIELD CREEK WETLANDS (MISS.)	CALLOWAY, GRAVES	11 14 16 18 20	SEDIMENT, BACT, METALS	KDOW, 1989; KDOW, 1991b	EVALUATED
08010201	OBION CREEK WETLANDS (MISS.)	CARLISLE,HICK.,GRAV	11 30 18	SEDIMENT, NUTRIENTS	KDOW, 1989	EVALUATED
08010201	WEST FK MAYFIELD CK WETLANDS	GRAVES	11 51 18	SED, NUTRIENTS, METALS	KDOW, 1989	EVALUATED
08010202	OWENS SLOUGH (MISS.)	FULTON	11 14 22	SEDIMENT	KNPS SURVEY, 1987	EVALUATED
08010202	RUNNING SLOUGH (MISS.)	FULTON	11	SEDIMENT, NUTRIENTS	USFW, 1988	EVALUATED

• COUNTY ABBREVIATIONS •

CALD. = CALDWELL
CHRIS. = CHRISTIAN
CRIT. = CRITTENDEN
GRAV. = GRAVES
HICK. = HICKMAN
HOPK. = HOPKINS
MUHL. = MUHLENBERG
WEB. = WEBSTER

Abbreviations Used in Data Source Table

Agricultural Stabiliztion and Conservation Service	ASCS
Kentucky Department for Health Services	HLTH DEPT
Kentucky Division of Water	KDOW
Ambient Monitoring Program	KDOW-AMB
Bacteriological Monitoring	KDOW-BACT
Bioassay Monitoring/Toxicity Testing Program	KDOW-BIO
Commonwealth Technology, Inc.	CTI
Groundwater Branch Monitoring Program	KDOW-GW
Intensive Survey Monitoring Program	KDOW-IS
Lakes Monitoring Program	KDOW-LAKE
Nonpoint Source Program	KDOW-NPS
Reference Reach Program	KDOW-RR
Kentucky Nonpoint Source Survey	KNPS
Kentucky Geological Survey	KGS
Kentucky Nature Preserves Commission	KNPC
Kentucky Department of Fish & Wildlife Resources	KDFWR
Metropolitan Sewer District	MSD
National Water Quality Assessment Program	NAWQA
National Park Service	NPS
Ohio River Valley Water Sanitation Commission	ORSANCO
Tennessee Technological University	TN-TECH
University of Kentucky	UK
United States Army Corps of Engineers	USACOE
United States Department of Agriculture	USDA
United States Environmental Protection Agency	USEPA
United States Forest Service	USFS
United States Fish and Wildlife Service	USFW
United States Geological Survey	USGS

Nonpoint Source Category Codes

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10 Agriculture
- 11 Non-irrigated crop production
- 12 Irrigated crop production
- 13 Specialty crop production (e.g., truck farming and orchards)
- 14 Pasture land
- 15 Range land
- 16 Feedlot - all types
- 17 Aquaculture
- 18 Animal management areas
- 19 Manure lagoons

20 Silviculture
- 21 Harvesting-reforestation
- 22 Forest management
- 23 Logging road construction/ maintenance

30 Construction
- 31 Highway - road - bridge
- 32 Land development

40 Runoff/Storm Sewers
(Includes runoff from residential, commercial, industrial, and park-land areas not covered under other source categories)

50 Resource Extraction
- 51 Surface mining
- 52 Subsurface mining
- 53 Placer mining
- 54 Dredge mining
- 55 Petroleum activities
- 56 Mill tailings
- 57 Mine tailings

60 Land Disposal
- 61 Sludge
- 62 Wastewater
- 63 Landfills
- 64 Industrial land treatment
- 65 Onsite wastewater systems (septic tanks, etc.)
- 66 Hazardous waste
- 67 Septage disposal

70 Hydrologic - Habitat Modification
- 71 Channelization
- 72 Dredging
- 73 Dam construction
- 74 Flow regulation
- 75 Bridge construction
- 76 Vegetation removal
- 77 Streambank modification - destabilization
- 78 Draining - filling of wetlands

80 Other
- 81 Atmospheric deposition
- 82 Waste storage - storage tank leaks
- 83 Highway maintenance & runoff
- 84 Spills
- 85 In-place contaminants
- 86 Natural
- 87 Recreational activities
- 88 Upstream impoundments
- 89 Salt storage sites

90 Unknown

Nonpoint Source Parameter Abbreviations

Parameters	Abbreviations or Notation
<u>Agriculture</u>	
Total Suspended Solids	SUSPENDED, SOLIDS TSS
Sediment	SED, SEDIMENT
Pesticides	PEST
Lindane	LINDANE
Dichloro-diphenyl-trichloroethane	DDT
Nutrients (ammonia, phosphorus)	NUTR, NUT
Bacteria	BACT
Dissolved oxygen	DO
Nitrates	NITRATES, NO_3
<u>Mining</u>	
Acidity	ACID
Manganese	Mn
Sulfates	SO_4
Aluminum	Al
Metals	MET
Iron	IRON, Fe
pH	pH
Alkalinity	ALKALINITY, ALK
Specific Conductance	SP COND, COND
<u>Petroleum</u>	
Chlorides	Cl
Total organic carbon	TOC
<u>Urban</u>	
Oil-grease	OIL-GREASE, O/G
Arsenic	As
Solid waste	SOLID WASTE
Polychlorinated-biphenyls	PCB
Total dissloved solids	TDS
Bromide	Br
Sodium	Na
Calcium	Ca
Volatile organic compounds	VOC
Organics	ORGANICS, ORG
Fluorides	FLUORIDES, Fl
Cyanide	CYANIDE
Fuel (Gasoline, Diesel	FUEL
Inorganics	INORGANICS, INORG

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